The Milbank Memorial Fund

QUARTERLY

CONTENTS

		Page
In This Issue		229
Constructive Rural Farm Population Changes	*Carl C. Taylor* and *Conrad Taeuber*	233
Four Years of District Health Administration in New York City	*John L. Rice, M.D.* and *Margaret W. Barnard, M.D., Dr. P.H.*	253
The Dental Problem of Elementary School Children	*Henry Klein D. D. S.* and *Carroll E. Palmer, M. D.*	267
Social and Economic Problems in the Control of Tuberculosis	*Bailey B. Burritt*	287
Results of Distance Vision Tests in a Rural Population	*Ralph E. Wheeler, M.D.*	294
A Study of Mortality Among Individuals with Active Pulmonary Tuberculosis	*Jean Downes*	304
Annotations		
Tuberculosis Among Children and Young Adults	*H. R. Edwards, M.D.*	318
Syphilis, Gonorrhea and the Public Health	*Ralph E. Wheeler, M.D.*	320

Vol. XVI JULY 1938 No. 3

Edited by the Technical Staff
Published quarterly by the MILBANK MEMORIAL FUND, 40 Wall Street, New York, New York. Printed in the U. S. A. Subscription: $1.00 a year

IN THIS ISSUE

THE social and economic characteristics of the chief sources of our future population are matters we can no longer safely ignore. Studies have repeatedly indicated that highest birth rates in this country are found in rural areas where levels of living are lowest, where schools are poorest, and where health facilities are most meager. The far-reaching implications of this situation are realized when we consider that, due to low birth rates in large urban centers, the cities must draw upon the surplus population of benighted rural areas for a substantial part of their population renewals. In an article, "Constructive Rural Farm Population Policies," Dr. Carl C. Taylor and Dr. Conrad Taeuber of the Division of Farm Population and Rural Life, United States Department of Agriculture, emphasize the need for attention to the problem and suggest several broad lines of attack.

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During the last quarter of a century it has become increasingly evident that decentralization of some of the functions of the Health Department will make health services more effective in a great metropolis, where each neighborhood, equal in size to a small city, has its own characteristic population and health problems. In New York City, a broad district health administration program has been launched by the Department of Health. The article, "Four Years of District Health Administration in New York City," by Dr. John L. Rice, the Commissioner of Health, and Dr. Margaret W. Barnard, the director of the Bureau of District Health Administration, reports on the progress made since 1934 in organizing the City's health activities on a district basis. The experience of these four years has already demonstrated the advantages and soundness of a city-wide district program.

Dental defects of school children constitute an important health problem and it is known that the care of dental conditions in children is greatly neglected. The prevalence and extent of attack by caries and of accumulated, uncared for carious permanent teeth in school children is revealed in "The Dental Problem of Elementary School Children" by Drs. Henry Klein and Carroll E. Palmer of the United States Public Health Service. An examination of about 95 per cent of the enrolled white children in the grade schools of Hagerstown, Maryland, provided data to indicate that new dental carious defects accrue in the permanent teeth each year at a rate which is approximately six times the rate at which fillings are placed.

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That tuberculosis, both because of its high incidence among adults and because of its long duration, tends to undermine the economic stability of families, has long been recognized. However, little data on the subject has been published. In the article, "Social and Economic Problems in the Control of Tuberculosis," Bailey B. Burritt, executive director of the New York Association for Improving the Condition of the Poor, summarizes the results of studies of the social and economic condition of the families of tuberculous patients living in Syracuse, New York, and in New York City. These studies present evidence that little attention has been paid to the provision of a budget adequate for the food, clothing, housing, and the necessities of life, needed in addition to medical treatment, nursing supervision, or sanatorium and hospital care.

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The testing of distance vision has been a part of the routine health examination for many years. The examinations made on rural folk reported in previous issues of the *Quarterly* included distance vision tests, and the present article on "Results of Distance Vision Tests in a Rural Population," by Dr. Ralph E. Wheeler, extends the necessarily limited report previously made in the series on "Impairments in a Rural Population." Particular attention is paid to the question of the correction of defects of distance vision by glasses, and a supplement to the present method of testing is advocated as a further refinement of the routine procedure.

The seriousness of tuberculosis is shown by the high risk of mortality within a few years after diagnosis. The article "A Study of Mortality among Individuals with Active Pulmonary Tuberculosis" by Miss Jean Downes of the Fund's staff presents unique data based on the experience of a group of unselected cases followed throughout a period of years. For example, it shows that at the end of a five-year period after diagnosis of active disease the public health administrator may expect a mortality of approximately 22 per cent among active cases classed as minimal when diagnosed and a mortality of 43 per cent among those classed as moderately advanced. Relatively few diseases have such a high fatality as does tuberculosis and the study indicates the importance of prevention of the spread of infection so that active cases of the disease will develop much less frequently.

CONSTRUCTIVE RURAL FARM POPULATION POLICIES[1]

by CARL C. TAYLOR *and* CONRAD TAEUBER[2]

IT IS impossible to discuss farm population policies without considering trends, activities, and programs which involve rural nonfarm and urban populations and situations. We have narrowed the title of this paper because we want the focus to be constantly on those people who depend directly upon agriculture for their economic support in whole or in part. We are assuming as a guiding criterion that the farm population should be so distributed as to make the maximum efficient use of its basic natural resource—the land—toward the objective of attaining and maintaining the highest standard of living possible.

In order to come quickly to an understanding of the heart of the problems involved in suggesting constructive programs for reaching this objective, we shall assume that a discovery of maladjusted areas of the Nation is a good starting point. These areas are depicted graphically under the seven following headings:[3]

1. Low income areas—including those counties in which 50 per cent or more of the farms in 1929 reported less than $600 as the value of all products, sold, traded, or used by the operator's family—are shown in solid black in Figure 1. The mean value of all farm products for families with incomes of less than $600 was $375, of which approximately one-half represents the value of farm products consumed at home.
2. Farm labor areas—including those counties in which 50 per cent

[1] A paper presented at the Round Table on Population Studies, Sixteenth Annual Conference of the Milbank Memorial Fund, New York City, March 28, 1938.

[2] Respectively: In Charge, Division of Farm Population and Rural Life, Bureau of Agricultural Economics, United States Department of Agriculture, *and* Agricultural Economist, Division of Farm Population and Rural Life, Bureau of Agricultural Economics, United States Department of Agriculture.

[3] For further information concerning these criteria and the procedure used *see* Taylor, Carl, C. *et al:* Disadvantaged Classes in American Agriculture. Social Research Report, No. VIII, United States Department of Agriculture, 1938.

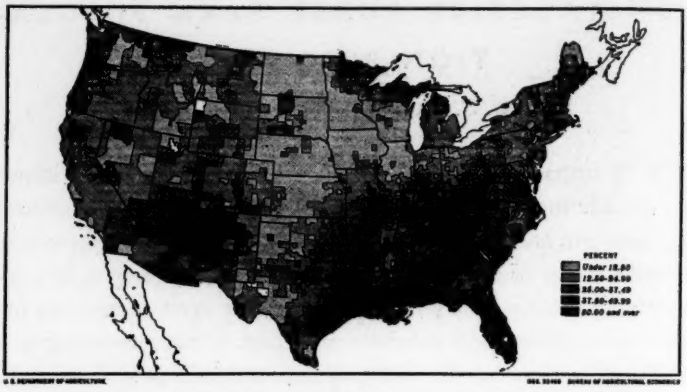


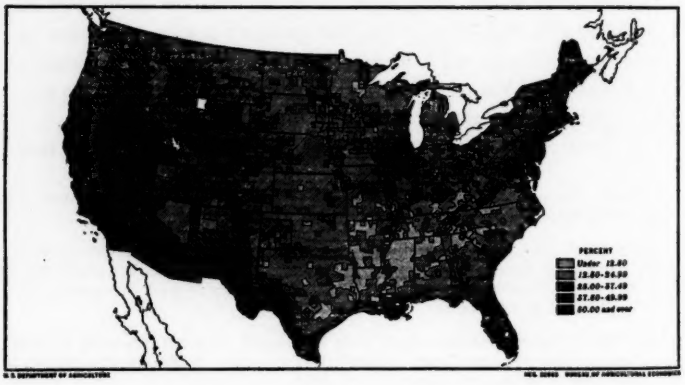
Fig. 1. Farms with gross income under $600; percentage of all farms, 1929.

or more of the persons whose gainful occupation was in agriculture, were farm laborers—are shown in Figure 2.

3. Farm tenancy areas—including those counties in which 50 per cent or more of the farm operators were tenants, or croppers, i.e., persons who did not own any part of the land they were operating—are shown in Figure 3.

4. Poor land areas—including those counties in which 20 per cent

Fig. 2. Hired farm laborers among gainfully employed in agriculture, per cent of total, 1930.



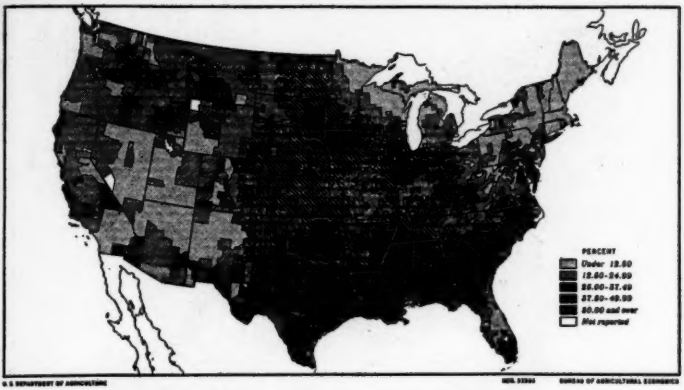


Fig. 3. Tenants among farm operators; per cent of total, 1930.

or more of the farms should be replaced because of maladjustments in land use—are shown in Figure 4.

5. Migration areas—include those counties in which the rural population between 1920 and 1930 lost by migration a number of persons equivalent to 30 per cent or more of those there at the beginning of the period, taking into account the natural increase. Such a heavy exodus from the rural areas of a county, may, in general, be taken as evidence of serious maladjustments (Fig. 5).

6. Heavy relief areas—include those counties in which, in June 1935, the total number of persons receiving relief, financed in whole or in part from Federal funds, was equal to or greater than 30 per cent of the population of the county in 1930 (Fig. 6).

7. Areas of low rural farm standards of living—include those counties in which a standard of living index was 20 or less; the range for the index being from 0 to 100. The ratings were based upon the proportion of farm homes possessing such facilities as electric lights, water piped to the dwelling, telephone, radio, and the proportion of farms reporting an automobile (Fig. 7).

It is clear that to a large extent these seven items are interrelated and that in general they show persistent population maladjustment. The chief exceptions are that a high percentage of farm laborers is very often associated with a high agricultural income for the area,

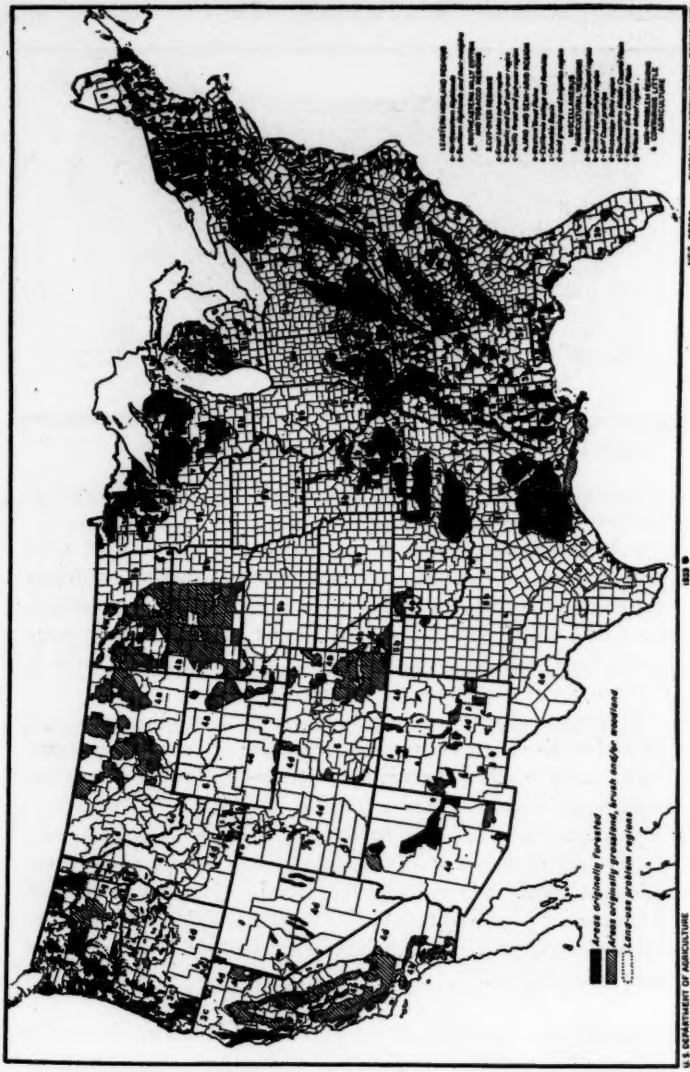


Fig. 4. Areas in which it appears desirable to encourage permanent withdrawal of a part of the arable farming and develop constructive use of the land not to be in farms.

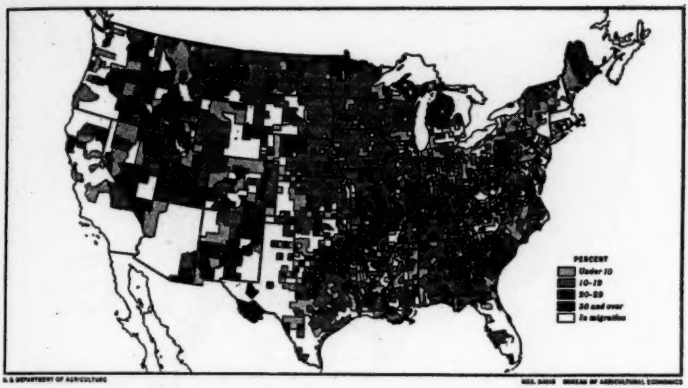
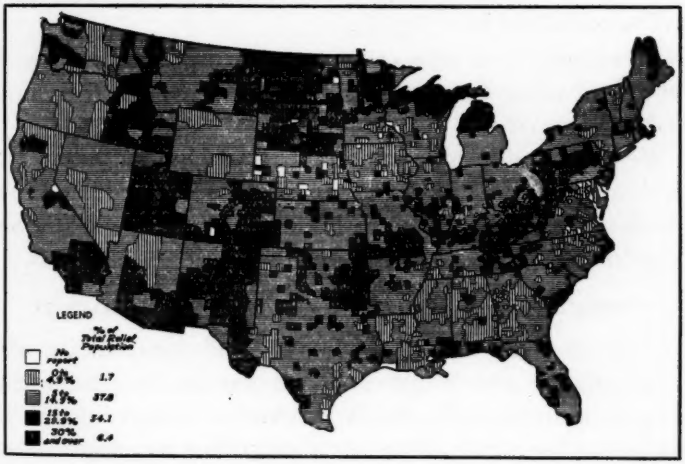


Fig. 5. Counties in which the net migration from rural areas, 1920-1930, was equal to specified percentage of the rural population in 1920.

though typically not for the farm laborer, and that only the southern tenant belt should be considered in this discussion.

The mapping of each type of maladjustment clearly reveals areas in which population subjected to the condition being considered

Fig. 6. Intensity of relief, June 1935. Ratio of persons receiving relief, June 1935, to total population, April 1930, by counties.



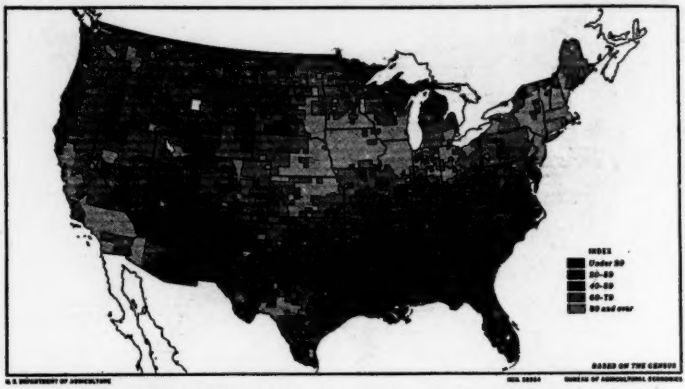


Fig. 7. Standard of living index, 1930. Based on per cent of farm homes with electricity, telephone, radio, automobile, and water piped to dwelling.

is concentrated. When these areas are compared with each other, it becomes clear that in certain areas in the Nation the farm inhabitants for one or more reasons are securing a level of living which is relatively very low.

In order to avoid the effects of isolated or accidental factors, only those counties which were classified in three or more of these groups will be considered here (Fig. 8).

Two hundred and forty counties are included in this group of most disadvantaged areas, two hundred and twenty-four of them in the southern states.

We shall not discuss in detail the areas outlined on these maps, but it will be well for the reader to have clearly in mind just where the chief areas of population maladjustment are located while we consider some of the generic problems and trends in such areas.

UNPLANNED TENDENCIES TOWARD POPULATION ADJUSTMENTS

Under the influence of modern means of transportation and communication and in light of the fact that the American people have always been highly mobile, it would be expected that there would develop tendencies to adjust population to economic and

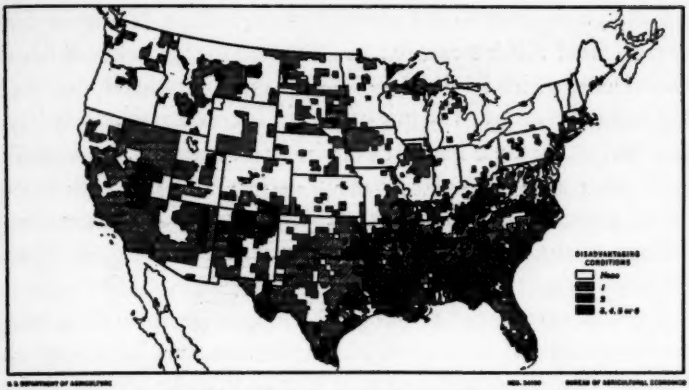


Fig. 8. Areas in which marked disadvantaging conditions prevail in American farm life.

social opportunities. Let us therefore give brief consideration to these tendencies or trends. In the 224 counties located in southern states, referred to above, the population has shown the following changes since 1920:

Total Population	1930	4,260,663
Per Cent Change	1920-1930	−2.9
Rural Population	1930	3,575,561
Per Cent Change	1920-1930	−6.8
Per Cent Net Rural Migration	1920-1930	−23.3
Farm Population	1930	2,579,053
Per Cent Change	1930-1935	+6.8

The number of persons leaving the rural areas was equal to 23 per cent of the number of rural residents. Since the natural increase amounted to 16 per cent, there was, therefore, a net decrease of about 7 per cent. Comparable figures for the period 1930-1935 are not available, but it appears that the farm population increased 6.8

per cent, compared with a national average of 4.5. Not more than two-thirds of this increase can be attributed to the back-to-the-land movement; which in these counties was proportionately less than the national average. The rate of natural increase is relatively large and part of the total increase is to be attributed to it. In common with other areas of maladjustment, and in contrast to the better farming areas, these counties in addition to receiving migrants from villages, towns, and cities retained a goodly portion of their natural increase during the depression years.

Thus, assuming that a considerable migration from these areas between 1920 and 1930 constituted an unconscious, or at least unplanned attempt at adjustment, it is clear that the migration was not of sufficient magnitude to effect the needed adjustments and that developments since 1930 have contributed to further intensification of the existing maladjustments.

In addition to the tendency of southern farm population to move away from farms and even away from the South, there has been a considerable upward trend in southern industrial development. Opportunities in other than the extractive industries have been increasing in the southern states more rapidly than in any other part of the country. Although the South is still more rural and more agricultural than any other part of the country, it has had a more rapid growth in its urban population and in the proportion of its workers in nonagricultural occupations than any other section.

The case of cotton textiles is most striking. In the crop year 1921-1922 there were 35,707,000 active cotton spindles in the United States, of which 44 per cent, or 15,906,000, were in the fourteen cotton growing states.[4] By 1936-1937 the numbers had changed to 23,808,000 of which 73 per cent, or 17,439,000, were in the cotton growing states. Taking the number in 1921-1922 as 100, the numbers fifteen years later, during 1936-1937 are:

[4] Alabama, Arkansas, California, Georgia, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia.

United States Total	67[5]
New England	31
Cotton Growing States	110
All Other States	39

The greatest increases occurred in Alabama, 100 to 140, and Georgia, 100 to 122, but North and South Carolina also reported increases from 100 to 108 and 110 respectively.[6] This trend has continued during the depression years, and it is significant that in a number of industries—cotton goods, dyeing and finishing textiles, knit goods, shirts, silk and rayon, woolen goods, worsted goods, men's clothing, boots and shoes—the number of wage jobs[7] in the South Atlantic states actually increased between 1929 and 1933, although in each of these industries the number of wage jobs in the entire country showed a decrease.

During this same period, the East South Central states increased the number of wage jobs in knit goods, worsted goods, men's clothing, pottery, tin cans and other tinware, glass and rubber goods and tires, industries which reported a net decrease for the entire United States during these years.[8] Although none of the increases reported in the southern states is large, and in no given industry did the increases exceed 7,000 wage jobs, the significant feature is that there were increases during a period when the same industries in other parts of the country reported decreases.

It must not be overlooked that some of the industries involved in these shifts of wage jobs are highly mobile, shifting from one area to another as the relative costs shift. Any change in the relative levels of costs, especially of labor costs, might be followed by move-

[5] Revised Tables on Cotton Textiles, Bringing to Date the Report of the Sub-Committee of The Cabinet Committee on the Cotton Textile Industry (1935) April 1937. Table 12, page 10. This supplements Senate Document 126, 74th Congress, 1st Session.

[6] Ibid: Table 15.

[7] Wage jobs: average number of wage earners employed, i.e., the number who would be steadily employed if the work were spread evenly over the year.

[8] Adapted from Craemer, Daniel B.: Is Industry Decentralizing? Bulletin No. 3, Study of Population Redistribution, University of Pennsylvania Press, 1935, p. 105.

ment to some other areas. The competition for industry within the South, where low wage areas are competing with areas that have had industrial plants longer, and therefore have a relatively higher and more stable wage level, is a case in point. Should the South lose much of its present competitive advantage through low labor costs, the observed shift of industry to the South may be stopped or reversed.

At the present time, however, it is clear that those areas in which the adjustment between natural resources and population has been least adequate have been experiencing both migration to other areas and an expansion of nonagricultural opportunities.

The reflex of southern population migration is felt in those areas to which migrants flow. The counties in solid black on Figure 8 include a larger part of Kentucky's area than of any other state, and the present locations of persons born in Kentucky will therefore illustrate the course of the out-movement of population from disadvantaged areas. In 1930, 30 per cent of the 3,300,000 persons born in Kentucky were living outside their native state. Of those, two-thirds were in northern and northeastern states and one-fourth were in the South. Classified by residence, they show 61 per cent in cities and only 18 per cent in rural farm areas, the remaining 21 per cent being classified as rural nonfarm. The four large cities of Cincinnati, Indianapolis, Chicago, and Detroit together contained 143,000 Kentucky-born persons, and the nearby cities, Evansville, Indiana; Dayton and Hamilton, Ohio; St. Louis, Missouri, each reported more than 10,000 Kentuckians. Kentucky had also contributed to the movement to California, Los Angeles alone reported 13,000 of them, as many as either Dayton or St. Louis.

Data for other southern states reveal similar results. Thus one-fourth of the persons born in South Carolina were living outside their native state in 1930, although two-thirds of these were in other southern states. However, New York with 38,000 leads all other cities outside of South Carolina in the number of natives of that

State. Philadelphia with 29,000 is next. Charlotte, North Carolina, leads other southern cities with 19,000. Winston-Salem, North Carolina; Augusta and Savannah, Georgia; Jacksonville, Florida; and Washington, D. C., each reported more than 10,000 natives of South Carolina.

Native Georgians showed a similar distribution outside of their own state. Among those who had gone to northern states there were 29,000 in Detroit, 27,000 in New York, 25,000 in Chicago, and 25,000 in Philadelphia. More than three-fourths of these persons were Negroes. Furthermore, one-half of those who had gone to other southern states were living in urban areas; among them 34,000 were in Jacksonville, 27,000 in Chattanooga, and 20,000 in Birmingham.

It thus appears that the migrants from the areas described as showing greatest population pressure contributed to the stream of migrants to the northern and eastern cities. The migrations of Negroes from southern states during the twenties and the last half of the preceding decade built up the large concentrations of Negroes in New York, Philadelphia, Chicago, Detroit, and other northern cities. In passing, it may be remarked that whatever the facts concerning the whole back-to-the-land movement during the depression years may be, almost none of the Negroes who had gone to northern cities before 1930 returned to southern farms after that year.

The destination of migrants from disadvantaged areas during recent years cannot be outlined with certainty. The migrations to the West Coast states from areas harassed by persistent and severe drought have received widespread attention. This movement has been paralleled and possibly exceeded by a continued shifting within and between the states in the drought area. As has been pointed out, the areas in which agriculture is primarily concerned with production of crops for the market continued to send out emigrants between 1930 and 1935. Some of the areas in which population pres-

sure was greatest in 1930 increased their farm population by 1935 through the combination of a marked restriction of migration of the numerous young people coming to maturity during those years and of a movement from cities and villages to farms.

Thus it is seen that in recent years the unconscious, or at least unplanned, trends toward adjustment of farm population have reflected themselves chiefly in currents of migration, primarily from rural to urban areas, and especially to the metropolitan districts. The movement has been to a large extent from southern to northern states, with the destination of migrants chiefly in the industrialized northeastern states and the states on the Pacific Coast. These currents have also flowed from southern farms and villages to southern cities which grew with exceeding rapidity between 1910 and 1930. Urbanization has taken place more rapidly in the South than in any other section of the Nation and is apparently destined to continue. Southern industries whether indigenous, transplanted, or vagabond are creating jobs for an ever-increasing number of persons, many of whom will come from southern farms.

These unplanned trends in migration from practically all overpopulated rural areas have by no means accomplished complete adjustment by the absorption of excess farm population in growing urban centers and expanding industries in some of the maladjusted areas, as can readily be seen from the facts presented in Figures 1 to 8. There is, therefore, ample reason to give consideration to what may be called planned adjustments.

PLANNED PROGRAMS OF ADJUSTMENT

In considering possible programs of adjustment or programs for alleviating pressure of farm population on natural agricultural resources, three broad lines of attack present themselves. We can attempt to decrease birth rates in such areas; we can attempt to move part of the population out of the areas; and we can attempt to assist those living in the areas to make better adaptations to and

higher uses of their present, but as yet not fully developed, physical, economic, and social resources. Or, of course, we can choose to do nothing and let the inhabitants of these areas pay the price of continually handicapped lives and let the general public pay the price of tremendous relief expenditures.

We shall not discuss the fourth of these choices because we assume that it is daily proving its impracticability.

It is not a digression at this point to state why unlimited and uncontrolled production of farm products will not solve these problems. The reasons are simple. They are: *First,* that national welfare demands the conservation of the land above all other natural resources as a cure for too exploitative a system of production in the past and a prophylactic against its continuance in the future; *second,* that if maximum efficiency in producing volume of farm products is practiced, it is already clear that commercial agriculture cannot absorb population in excess of that which is now engaged in the production of farm products for the market. Half the farms of the Nation in 1929 were not needed to feed and clothe the nonfarm people. This half produced only 11 per cent of all products sold or traded. Since 1929 there has been a restriction of export markets, a tendency toward concentration of commercial production on the more fertile lands, and an increase in mechanization of agriculture. The present prospect is that there will be no reversal in these tendencies, and that we are not likely to witness any increased demand for man power in commercial agriculture in the immediate future. During the period between 1930 and 1935, when the migration from farms was considerably less than during the twenties and when in some areas farms were receiving many migrants from cities, the commercial farming areas—the corn, cotton, and wheat belts—not only absorbed less than their share of the migrants to farms, but in some cases actually lost farm population.

One cannot study these unplanned trends and not know that the solution offered by some people of retaining on the farm all of the

population that originates there and asking agriculture in times of depression to absorb the unemployed of the city, simply will not work in terms of social welfare. Such a solution would result not only in low farm prices for all farmers, because they were overproducing their markets, but would mean that the excess farm population, swollen by those who return from the city, would pile up in the poor land areas of the country.

We have little to offer by way of suggestions for reducing the birth rate in these problem areas. This is a subject which requires much further study before engaging upon any policies toward that end. Furthermore experience in this country indicates that the breaking down of the isolation of rural areas and the increased amount of education have so affected attitudes toward family size and reproduction that a reduction in rates of increase has followed. At the present stage of our knowledge it is not clear that rates of natural increase are subject to planned manipulation. Our view is based on the assumption that the basic adjustments must be made with the persons already born and growing to adulthood now. If these adjustments can be effected, the solutions to some other long-range problems will assume different proportions than they do at present.

Furthermore, it is clear that a decrease in the birth rates in these disadvantaged areas will not quickly alter the situation, or decrease the necessity for other remedies, for it is obvious that even if there should be a precipitous decline in birth rates, its major effect would not be felt until eighteen to twenty years hence. In the meantime, in the states most affected, the available openings on farms due to death or retirement are only about one-half to one-third as numerous as the number of young people reaching maturity and becoming available for these jobs.[9]

9 Woofter, T. J., Jr.: Replacement Rates in the Productive Ages. The Milbank Memorial Fund *Quarterly*, October, 1937, xv, No. 4. The replacement rates given there are in terms of rates of increase in the age group 18-65, but can be adapted to the form of the statement made above.

Nor does it seem profitable to view with alarm the fact that disproportionately large numbers of our population are born in areas which on the basis of past performance are classified as problem areas. The place where a person is born is not a measure of his innate capacities, any more so than the month of his birth. To argue that emigration from problem areas to cities should be encouraged as a eugenic measure—the poorer stocks being thus brought into the cities where they reproduce less and thus eventually die out[10]—is scarcely tenable. An ideal social system would be a relatively fluid one, selecting its leaders on the basis of competence of the individual rather than his ancestry. This requires a degree of mobility—both horizontal and vertical—which we do not have fully today. Demonstrably hereditary and serious defects can and should be prevented by a program of negative eugenics. Beyond that the most profitable policy at present would appear to be one of facilitating the adjustments of population to resources by a program dealing with the people already here.

The most universally applicable remedy for farm population pressure is the development of the highest degree possible of balanced farming in which "live-at-home" farming on the best as well as on the relatively poor lands of the Nation is practiced. The promotion of such a system of farming is not, as some argue, an attempt to turn back the pages of progress. It is an attempt to write the greatest degree of security under the lives of millions of farm families who have their destinies in their own hands to a greater extent than any other segment of our national population. It is based upon the theory that complete economic specialization and geographic division of labor in agricultural production increases freight, storage, financing, and middleman costs to such an extent that farmers of one region do not provide good markets for family consumption products grown in other regions. It is based further

[10] Spengler, Joseph J.: Migration Within the United States. *The Journal of Heredity*, January, 1936, 27 (1): 2-20.

upon the fact that even on the best lands of the Nation, where commercial crops utilize practically all of the tillable land, it would be a safer program of human welfare to balance production for the market with the maximum extent of production for home use. The direct result of not doing this in the South, where the standard of living is low, and population maladjustment is most obvious, is the absence of milk, eggs, and fruit in the diet of cotton producers. The remedy is the production in the South of these products for home consumption. This means a greater degree of self-sufficient farming. It is a problem in planning and promoting a definite type of rural culture in the same intelligent and vigorous fashion that we now promote programs of soil conservation, rural rehabilitation, agricultural production and price adjustments, and better land use adjustments.

There is no question that many of the more than three million farm families which in 1929 produced only 11 per cent of the market farm products could make a better living if they would move to better lands. Nor is there any question that better lands can be found for them. If they had twice as good a land base as they now have and would use the land to produce the maximum usable products for home consumption they probably could raise their material standards of living by at least 50 per cent without becoming involved in the market to any greater extent than at the present. The issue is not, however, primarily one of finding better land for these self-sufficient farmers, for that would be comparatively easy; it is not the issue of increasing their capacities for producing more home consumable goods, for this could be accomplished not only by getting them on better lands, but by their learning more about canning and preserving foods, and home crafts of all kinds. The real issue is whether these people would retain their self-sufficient culture if they left their relative isolation and settled in the communities where commercial farming is universal. Unless they exercised conscious control and unless there was promoted in these

communities a planned program of self-sufficient farming they would probably, within a generation be attempting to "make a killing" in cotton, wheat, tobacco, or some other commercial crop and thus would destroy their old self-contained culture while they increased the volume of farm products offered to the market. This is exactly why some of the worst rural social conditions exist on some of the best lands of the Nation and is one of the chief causes of low standards of living among the share croppers of the South, who live in a climate where they can guarantee themselves a pretty decent material standard of living by practicing "live-at-home-farming."

The second most applicable remedy is probably the combination of farming and other occupations. This can be "subsistence homesteading" not only near large cities but near smaller cities and towns and in rural villages. Because of modern means of transportation and recent developments in transmissible power, there can be a considerable decentralization of industry; and by a little nurture and guidance there can be a great expansion in handicraft production. Handicrafts are being slowly eliminated from our rural districts because no one is giving adequate attention to markets for them. This means not only the loss of possible income to thousands of farm families, but the elimination from our rural civilization of one of the most creative elements in it.

A third program can and should be that of resettlement, an intelligently conceived and conservatively conducted program of guidance for already highly mobile populations in their attempts to find better orientation to the land resources of the Nation. Such a program should include employment services, vocational education, actual loans, and farm and home supervision to help "resettlers" establish themselves in new locations.

Some steps have already been taken in this direction.

The Subsistence Homesteads program was the first. This was followed by the so-called "submarginal land" purchase program, then

the "rural-industrial-community" program of the F.E.R.A., and finally by the Rural Resettlement program. In addition to these was the relocation program of the T.V.A., necessitated by the evacuation of areas flooded by the water reservoirs created by power and flood control dams. All of these programs have been more successful than is generally believed by the public. The Subsistence Homesteads program not only established a number of suburban settlements, but also a number of small farm projects. The suburban projects promote the combination of urban employment and subsistence gardening at the periphery of cities. The farm projects assist stranded coal miners and southern tenant farmers to become self-sufficient farm owners. The "Rural Industrial Community" projects make a definite attempt to encourage the decentralization of small industries; and the "Sub-marginal Land Purchase Program" removes from wrong uses lands where soil wastage is taking place so rapidly as to jeopardize the standards of living of the population in these areas.

Since the lands acquired are ordinarily devoted to more extensive uses, such as forestry, water conservation, wild life refuges, range, and parks, they can under their new use support only a fraction of the families now residing there. In some cases lands better suited to agriculture have been made available to the persons in the purchase areas; in other cases they have been assisted in going to new locations which they themselves found. Finding suitable locations for the displaced families has hitherto proven one of the major problems of this work, and its successful solution is a prerequisite to such a program if it is to make a contribution in connection with the population problem outlined.

The limits of such a program of land acquisition become readily apparent if it is borne in mind that the National Resources Board recommendations in 1935 called for the withdrawal of 75,000,000 acres from agricultural production. There need therefore to be added to the Land Purchase Program other ways of controlling

land occupancy in those areas where it is probably evident that the land as a natural resource will not support the population now resident there. Zoning probably furnishes the best approach to this problem.

Zoning has been developed in the state of Wisconsin to a considerable extent and is now being initiated in other states. By September 1937, twenty-three Wisconsin counties had closed by ordinance over 5,000,000 acres to agricultural settlement.[11] Eight other states have enacted laws similar to those in Wisconsin, and it seems likely that rural zoning will, in due time, prove to be a form of land control of major importance. For the time being, it will probably have to be primarily negative in scope, that is, it can probably do nothing more than prevent new settlers from moving in to areas that should not be occupied or returning to areas which have been partially evacuated. Like the relocation of settlers from land purchase areas, this is a problem urgently calling for a solution.

CONCLUSION

It is more than likely that sooner or later a turn in economic trends will again stimulate a marked flow of farm population to industrial centers. But even though this movement should become as great in magnitude as in the decade between 1920 and 1930, the data presented in the early part of this paper would seem to prove that there would still exist rural population problem areas. Unguided migration has not solved, but in fact created most of the problems of these areas in the past. There is no reason to believe it will solve them in the future. Increase in the mechanization and commercialization of farming has done somewhat the same thing. Crop control and price adjustments only slightly affect one-half of the farms of the Nation. Relief, unless it is something more than "made work" or the "dole," probably tends to stabilize populations in

[11] Wehrwein, George S. and Baker, J. A.: The Cost of Isolated Settlement in Northern Wisconsin. *Rural Sociology*, September, 1937, 2, No. 3, pp. 253-265.

areas which should be migrative. Something more is needed if we would attack farm population maladjustments by means of constructive and rehabilitative policies. The programs suggested here are:

1. The promotion of balanced or "live-at-home" farming, i.e., the maximum expansion of home-produced home-consumable products.
2. The encouragement of combined farm and industrial enterprises.
3. The intelligent guidance of the relocation, into both farming and industrial opportunities, of those who in the future, as in the past, will each year, in great numbers, move to new locations.

FOUR YEARS OF DISTRICT HEALTH ADMINISTRATION IN NEW YORK CITY

by JOHN L. RICE, M. D. *and* MARGARET W. BARNARD, M. D., DR. P. H.[1]

CITY health departments were created as a device through which the community, by taxation, could attain health improvement and protection. As the public became convinced of their usefulness they developed and advanced. Until shortly before the Great War they followed in general a uniform pattern of centralized control regardless of the size of the population served. During the last quarter of a century has come a recognition of the obvious geographical advantage of establishing localized service for many of the health departments' functions. The desirability of shifting from centralized to localized administration seemed especially evident in metropolitan areas. Thus was born the health center idea.

The "health center" is a term popularly applied to a wide variety of health undertakings, ranging from a small unit, where a handful of people receives some type of health service from a voluntary source, to a cooperative effort of public and private agencies undertaking to provide health service for a large population area.

In New York City we now think of a "health center" not as an isolated unit giving special services in a city "sore spot," but as one of the focal points of a city-wide administrative setup which localizes the work of a large department of health in districts of 200,000 to 300,000 population. The center makes it possible to bring together at one point the strength of all the health resources of the area for a common understanding, a united program, and an effective attack on the special health problems of that district as well as those that are common to the entire city.

Pioneer experiments to test the usefulness of health centers in

[1] Respectively: Commissioner of Health of the City of New York, *and* Director of the Bureau of District Health Administration.

selected areas had been going on for nearly a quarter of a century before the present broad district health administration program was launched in January, 1934, by the Department of Health.

Two broad general objectives were defined:

First, the health center as an administrative device, geared into the existing machinery of the Health Department, should make more effective the work of the functional bureaus of the Department.

Second, the health center as a district unit must become a vital and integral part of the community in which it is situated; it should serve as a focal point for informed community opinion and support in the field of public health.

Only as the first objective begins to be realized does the full meaning of the second become apparent, but the two are so closely interwoven as to form one pattern.

To initiate and build a structurally sound official program of district health administration on a city-wide basis has been a tremendous task. Changing from one type of departmental administration to another in a city so large as New York presents many problems. Ordinarily four years would be considered too short a period in which to attempt an evaluation of so fundamental and complex a new procedure. However, the existence of a large amount of demonstration data available for guidance, and the extraordinary speed with which the Department's health center program has forged ahead, due to the leadership and constant support of Mayor LaGuardia, makes the beginning of 1938 a suitable time at which to present a progress report and to look toward the future.

Our guidance in setting up this program was the experience of early health districts, started by Dr. S. S. Goldwater (Health Commissioner during 1914) in 1914 and carried on during 1915-1917 by Dr. Haven Emerson (Health Commissioner during 1915-1917) and of the health demonstrations conducted during the war and postwar periods.

The health districts of 1914-1917, while cooperating with the voluntary health and welfare agencies, were, in the main, branches of the Health Department. The health demonstrations were independent units, with no concern about adjusting their activities to a city-wide health program, and no need to balance their efforts with twenty-nine others in the same family group.

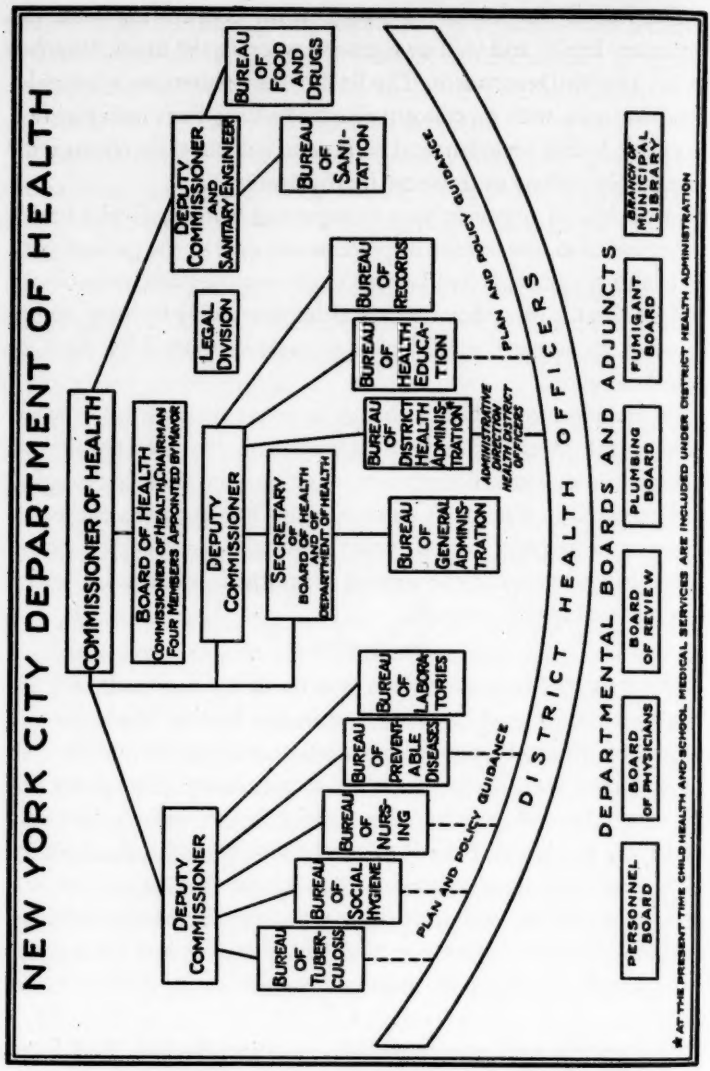
In the official city-wide plan, inaugurated in 1934, district health administration had to take its place as one part of the general public health program. It had further to observe the limitations of city budget. On the other hand it gained immeasurably by being recognized as an accepted official plan strongly supported by the City Administration.

To introduce so radical a change in administration into a static department would have been complicated. To accomplish this change in a dynamic department, which was constantly changing and expanding, was much more difficult. For example, the establishment of two new bureaus, tuberculosis and social hygiene, stimulated big advances in the control programs in their fields which was reflected in district work.

ORGANIZATION

The first step in organization was to set up the machinery for localized service and to create within the Health Department a Bureau of District Health Administration, with a full-time director. This Bureau was charged with the responsibility of mapping out the program and policies. The district health officers, working under the guidance of the Bureau of District Health Administration, were made responsible for carrying out in their districts the policies of the various bureau directors of the Health Department, for administrative supervision of the local services, and for suggesting program changes to make the work in the districts more effective.

The services which were already operating through field units, such as tuberculosis, child hygiene, etc., were first chosen to par-


NEW YORK CITY DEPARTMENT OF HEALTH
COMMISSIONER OF HEALTH
BOARD OF HEALTH
COMMISSIONER OF HEALTH, CHAIRMAN
FOUR MEMBERS APPOINTED BY MAYOR
DEPUTY COMMISSIONER
SECRETARY OF BOARD OF HEALTH AND OF DEPARTMENT OF HEALTH
LEGAL DIVISION
DEPUTY COMMISSIONER AND SANITARY ENGINEER
BUREAU OF FOOD AND DRUGS
BUREAU OF SANITATION
BUREAU OF RECORDS
BUREAU OF HEALTH EDUCATION
BUREAU OF DISTRICT HEALTH ADMINISTRATION
BUREAU OF GENERAL ADMINISTRATION
ADMINISTRATIVE DIRECTION HEALTH DISTRICT OFFICERS
PLAN AND POLICY GUIDANCE
DEPUTY COMMISSIONER
BUREAU OF TUBERCULOSIS
BUREAU OF SOCIAL HYGIENE
BUREAU OF NURSING
BUREAU OF PREVENTABLE DISEASES
BUREAU OF LABORATORIES
PLAN AND POLICY GUIDANCE
DISTRICT HEALTH OFFICERS
DEPARTMENTAL BOARDS AND ADJUNCTS
PERSONNEL BOARD
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* AT THE PRESENT TIME CHILD HEALTH AND SCHOOL MEDICAL SERVICES ARE INCLUDED UNDER DISTRICT HEALTH ADMINISTRATION

Fig. 1. Organization chart of the Department of Health of the City of New York.

ticipate in the localized program. (*See* Fig. 1). Later, the Bureau of General Administration participated by the assignment of custodial staff on a district basis and the Bureau of Laboratories by establishing local pneumonia-typing stations in some health centers.

Early in 1934 seven districts were selected as areas in which the need for more intensive health work was clearly evident. To each of these a full-time civil service health officer and staff were appointed. These first districts included two privately financed demonstration health centers, East Harlem and Bellevue-Yorkville, which were taken over by the City and incorporated in the new official program. The work of the Harlem Health Center, established by the City in 1930, was made the nucleus for the official Central Harlem Health District.

During 1935-1936 much time was spent in working out the new administrative procedures and relationships. The health officers had to gain both an intimate knowledge of the district problems and resources and a familiarity with the broad, general public health program. Many conferences were held between the bureau directors and the health officers so that each might know the assets of the other and how to work easily together. A manual of district health administration was prepared and published in preliminary form in 1936. This did much to clarify procedures.

As the work progressed it became increasingly apparent that district health administration as an administrative procedure would encounter innumerable handicaps unless it could be applied on a city-wide basis. In 1937 it was decided to place the entire City under the district plan.

To accomplish this two things were necessary. First, the small number of available district health officers was augmented by the assignment of physicians, from other services, to district health units under the title of medical-officer-in-charge. At the close of 1937, there were available thirteen district health officers and seven medical-officers-in-charge.

Fig. 2. Map of New York City, showing the health districts.

Second, the thirty districts were divided into twenty administrative units. Eleven districts operate as individual units, while the remaining nineteen are combined into nine areas for administrative purposes. (Fig. 2.) Coincident with this, the five Borough Offices of School and Child Hygiene were discontinued and their staff absorbed into district health administration, reducing duplication of service.

Thus at the end of four years, district health administration has established a framework throughout the City, in which the activities of functional bureaus may be more efficiently administered and render more effective service. The Ten Year Health Center Program contemplates the organization of all thirty districts by the close of 1945, each in adequate headquarters and with a full-time administrative officer.

BUILDING PROGRAM

To push the roots of this program deep into the soil of the community it seemed vital to have adequate local headquarters for the health officer, the nurses, doctors, and other groups who were to work in the unit. Besides this a solid structure in the district, around which the people of the community could rally and which they could call their own health building, was considered essential. While at first district offices were established on a small scale wherever they could be fitted into already existing city services, by the end of 1937, with the aid of PWA funds, nine new modern well-equipped buildings were completed and occupied.

Two additional buildings financed entirely by the City are now under construction. Funds for three others have been allocated in the 1938 capital outlay budget. In addition, the City purchased and remodeled one building, suitable for a health center. The continuing of the building program—the largest health building program ever undertaken by a city—is a definite part of the general Ten Year Plan.

These health center buildings provide adequate clinic room, offices for the executive staff and nursing units, an auditorium for lectures, and a certain amount of space for district welfare agencies. Free quarters are allocated to voluntary agencies on the understanding that an equivalent amount of additional service will be given to the district by the agency.

SUBSTATIONS

While the health center is the focal point for district work, there is need for a varying number of substations in each district. Some services, such as maternity, child health, and dental, are located at points throughout the area so that they may be easily available to the people. In some districts the case load necessitates more than one central tuberculosis or social hygiene service. Under WPA funds a building program is going forward for twelve new permanent child health stations. Cooperative arrangements with the Housing Authority have been made for allocation of space for health services in two of the new federal housing developments.

RESULTS IN TERMS OF DEPARTMENTAL SERVICE

There is no longer any doubt that the organization of a district under a full-time, competent health officer results in more effective service in that area. All available resources are carefully studied so that they may be used most effectively in relation to the particular needs and conditions of that district. Child health stations, for instance, are re-located so that their service is better adapted to certain transportation problems, population needs or racial customs.

When a new district service is to be established, the health officer assists the director of the functional bureau of the Health Department by recommendations based on local experience. He is in a position to know the best time and place for the work and he can attend to the necessary administrative details. As far as possible staff assignments from the Central bureaus are made on a district basis. This results in better working relationships, greater flexibility

of staff time within the district, and a greater interest on the part of the staff in district problems.

Along with the general knowledge and opinions gained by intimate contact with local work, goes a critical study of related basic data. Current records and basic statistics are readily available for use in program planning. Facts concealed by City or Borough figures show up clearly when data are segregated by districts or health areas. For example: In one district with a good economic status as a whole and few health problems, in terms of its customary morbidity and mortality rates, there seemed to be little need for any additional health service. However, in studying the neighborhood, the health officer found three health areas within the district with infant mortality rates of 51, 72, 65 for the period 1932-1936 compared with 47 for the district as a whole. Further study showed that a very high proportion of these deaths were neonatal, and that the maternal mortality rates for these three areas ranged from 8 to 16 (1932-1936) compared with 4 for the City as a whole. The health officer immediately started to search for the causes of this condition and to ascertain what steps could be undertaken for improvement.

Again, the tuberculosis mortality rate for New York City during a five-year period (1929-1933) was 66. Only by studying individual districts could we have discovered three districts in Manhattan with rates of 131, 155, and 247. In breaking down these three districts into health areas we found such startling rates as 372, 319, and 262. Obviously local statistical studies must be the guide for program planning.

The statistical data form the basis, but with this must go a knowledge of how to adapt the general program to the local problem. In the one district, for example, with a tuberculosis mortality rate of 131, four health areas had rates of 220, 208, 168, 130. These four areas represented a concentration of Puerto Rican and Negro population who did not use the tuberculosis service available in another part of the district where the population was largely Italian.

To remedy this situation a new convenient clinic service, with emphasis on Spanish speaking personnel, was established; a tuberculosis survey was conducted among home relief clients in the area; and intensive educational measures were begun. In the past year, 386 cases of pulmonary tuberculosis in these four areas have been discovered and placed under care, and the tuberculosis mortality rates are decreasing.

To further the use of current data by all members of the staff, the Bureau of District Health Administration in collaboration with the other bureaus, sends out each month to all those concerned, a six-months' study of some phase of the district work of one bureau. Questions are raised as to why deviations from the normal expectancy for that service have occurred. The district health officers, in consultation with the staff, prepare an answering report and discuss the problems. This device is new and needs to be developed further. However there is already apparent a keen interest in this phase of the work and suggestions for items to be included in these studies are coming in from district officers and bureau directors.

It has been possible through outside assistance during the past year, to make a study of the cost of services by bureaus and by districts for the year 1936. A pattern has been established so that cost analyses and service analyses can be correlated. So many pertinent facts have come to light in a preliminary analysis of this material that an extension of the study has been planned.

The general foundation of district health administration has been well laid, but many details of procedures and relationships must still be worked out. In a sense we are working in a pioneer field. Often in the early demonstrations that preceded our official district health administration program, a procedure would be introduced promptly as an experiment. Gearing new procedures into official machinery on a city-wide basis is much more difficult. Whole-hearted acceptance is gained by leadership rather than by authority. This requires time and patience and flexibility.

TEACHING CENTERS

In looking to the future, a large scale cooperative teaching program has been planned by the department and the five medical schools located in the City. Using five health centers for training purposes, this program will afford medical students an opportunity to learn about practical public health procedures and give department personnel the opportunity to secure post-graduate training. This is a program of great significance in its own right and will be the subject of later reports.

HEALTH EDUCATION

Of all the district services the one which is probably best suited to localization is health education. Effective teaching of health work must be based on an intimate understanding of the people to be taught. Subject matter must be adapted to many interests, traditional thought patterns and levels of intelligence. Health education seems also to be the field of public health which is least thoroughly geared into public health programs throughout the country. Too often it is the thing to be done if any money is left over. Trained personnel, tested procedures, and funds are inadequate. Four years of district experience have shown both the urgent necessity for organized health education among the people and some of the effective ways in which this can be done on a localized basis. Development of this work is one of the outstanding plans in the district program.

COMMUNITY ORGANIZATION

Four years' experience has shown that district administration can be and is an effective administrative device. There is also an accumulation of evidence that district health centers have already taken an integral and vital place in their communities.

The Department, through the health officer, offers to the community a variety of service planned with consideration for the needs

of that particular community. Medical services are efficiently administered and are carried out by competent doctors and nurses. Equipment is modern and adequate. Confidential information concerning patients is respected. Ethical relationships are maintained with the medical and dental professions. Up-to-date information on public health is made available to the public by health talks to selected groups, by lectures by qualified specialists to professional groups, by case conferences and round table discussions for workers in special fields, by the distribution of health literature, and by the courteous attention of the staff to requests for information.

Further, the Department has deliberately invited the advice and participation of the community in planning the district program. Community participation is effected through two district committees in each organized district: a District Medical Advisory Committee and a District Health Committee.

The District Medical Advisory Committee consists of from two to fifteen physicians who live or practice in the district. These members are recommended by the County Medical Society and are appointed by the Commissioner of Health. The medical committee has a twofold responsibility. It meets regularly with the health officer and advises with him concerning community health problems. It also reports back its opinions concerning district work to the County Medical Society. These district medical committees come under the direction of the Committee on District Cooperation with the Medical Profession (one of the standing committees of the Committee of Neighborhood Health Development). (*See* Fig. 1.) Advising the members of this latter group are two official representatives of each of the five county medical societies. This close relationship between the Health Department and the medical leaders, with its resultant understanding and tolerance, has become a most valuable asset to the district program.

The District Health Committee offers a similar opportunity for participation to workers in the district in various fields of health

and welfare, public spirited citizens, and representatives of civic, religious, and social groups. Members of this committee are appointed by the Commissioner. They meet monthly with the health officer to consider program planning and district problems. They, too, interpret to their own groups the policies and objectives of the Department, and present to the Department the needs of the district. Active subcommittees study, make recommendations, and help to solve the problems in special fields of district work, such as maternity and child hygiene, school health, health education, tuberculosis, and social hygiene. These committees have proved so effective and of such value to the Department that one of the most active standing committees is the one on community organization. This group is the parent body of the district committees and provides the services of a secretary and three field assistants for the development of this program.

Participation by the dentists of the districts is not yet as extensive as that of the medical profession but the same cordial spirit exists. Two or three local dentists are recommended by the Committee on District Cooperation with the Dental Profession and appointed by the Commissioner to membership on the District Health Committee or the Medical Advisory Committee.

A unique opportunity to present the health center philosophy and program to the community was found in the opening of eight new health center buildings during 1937. The Health Department and the Committee on Neighborhood Health Development conducted a most successful campaign for interpreting district health centers to the public through the press, the radio, opening and dedication ceremonies, and various other devices. A real civic pride was developed.

This vital integration of the local health center with its community has been possible because, through the Committee on Neighborhood Health Development, the entire program of health center development has been for nearly ten years a vital part of the

thinking of health and welfare leaders throughout the City. The Committee on Neighborhood Health Development, organized in 1929 with the Commissioner of Health as chairman, consists of leaders in the field of medicine, public health, social welfare, and allied groups. Its work has been of inestimable value. Its members have given substantially of their time and interest in advising with the Health Department and assisting in working out the program.

District health administration is now generally recognized throughout the City as a successful policy of the Department of Health. That other public departments and voluntary agencies are thinking along district lines for their own activities is a tribute to the painstaking, substantial foundation on which the centers have been built.

THE DENTAL PROBLEM OF ELEMENTARY SCHOOL CHILDREN[1]

by HENRY KLEIN, D.D.S. *and* CARROLL E. PALMER, M.D.

FINDINGS from a number of studies indicate that the order of 95 per cent of elementary school children of the United States are affected by dental caries.[2] Research workers in this field would agree, however, that the status and constitution of the problem, in representative groups of children, warrant further detailed statistical analyses. From the public health point of view, the collection of statistical information on the prevalence and extent of attack by caries, in school children, may be considered a first step in the analysis of this major health problem. Considerations such as the above are largely responsible for the initiation of a detailed study of the dental caries experience of the grade school population of a representative urban community.

COLLECTION OF DATA

The small city, Hagerstown, Maryland, the grade school children of which were studied, has a population of approximately 32,000 persons. Somewhat over 90 per cent of the inhabitants are native white and of these 95 per cent have native parents. The city contains several small manufacturing and industrial units and includes the usual retail and wholesale commercial establishments. In general, the population is representative of the broad middle range of socio-economic groups in the United States. Approximately 95 per cent of the children of grade school age attend the municipal elementary schools. The enrollment of white children in the first eight grades of these schools was, in October 1936, approximately 4,700. Of this number, 4,416 received, in the spring of 1937, complete dental examinations by dental officers of the United States Public Health

[1] From Child Hygiene Investigations, Division of Public Health Methods, National Institute of Health, United States Public Health Service.

[2] *See* bibliographic references.

Service. The children examined, therefore, include 94 per cent of the enrolled elementary school population. The distribution of these children, with respect to age and many other characteristics, may be considered representative of many urban communities in the United States.

The collection of the data which form the basis of the present paper was preceded by conferences with the community dental, health, and school authorities,[3] whose cooperation made the study possible. The two dentists assigned to the task of making the dental examinations received preliminary training designed to better acquaint them with the peculiar demands of dental examinations of school children. Each of the dental officers was supplied with a portable dental chair, equipped with adjustable head rest and such essential accessories as examination lamp, mirrors, explorers, bracket tables, and steam sterilizers. Enough instruments were supplied to make possible a satisfactory sterile technique in the examination procedure. In addition, each examiner received aid from a dental assistant in the assembling and sterilization of instruments and in the handling of the children. These dental assistants functioned, also, as secretaries in that the findings of each examination were recorded by the assistant from coded, verbal information supplied by the examining dentist. This arrangement greatly facilitated the examination procedure and permitted the dentists to spend all their time in making examinations of the teeth.

The examinations were made with Number 3 plain mirrors and fine pointed pig-tail explorers under favorable lighting conditions. Observations were made on *all* teeth present in the mouths and, in

[3] The authors wish to acknowledge their indebtedness to the many individuals who made possible the collection of material for this paper: To Dr. C. O. Diehl, Dr. P. L. Russell, and other members of the Washington County Dental Society, Maryland, special thanks are due for sympathetic support of the project; to Superintendent B. J. Grimes and the teachers in the Hagerstown schools, grateful appreciation is acknowledged for active cooperation and assistance; to Dr. W. Ross Cameron, County Health Officer of Washington County, to Drs. R. C. Leonard and R. H. Riley of the Maryland State Health Department, and to Dr. C. W. Wekenman of the United States Public Health Service, acknowledgment is made for helpful advice and assistance.

addition, unerupted and extracted permanent teeth were noted. Pits and fissures in which the explorer caught and which after thorough inspection were not considered definitely carious were noted as separate items and were not counted as caries. Teeth designated as carious were those which showed actual although, occasionally, small cavities. The lesions recorded are those which are readily found on careful clinical dental examinations. The extent of caries in any single tooth was measured in terms of tooth surfaces involved. When such areas extended from one surface to others, the involved surfaces were counted separately as carious surfaces. Remaining roots were considered as equal to five carious surfaces. Records for filled teeth were made in a similar manner, that is, filled surfaces were considered as past carious surfaces. Full crowns, of which few were encountered, were considered equal to five filled surfaces (five surfaces affected by past caries).

FINDINGS

Preliminary Considerations. Before proceeding with the presentation of data derived from the study of 4,416 grade school children, it is essential to consider, briefly, certain constituents which make up the caries problem and the manner in which these affect the measurement of dental status and needs in children. The first of these considerations concerns the numbers and kinds of teeth present in, or absent from, the mouths of the children examined. The range of age of elementary school children, 6 through 15 years, covers the period during which the deciduous is being replaced by the permanent dentition. Since entirely different teeth and numbers of teeth are involved in the description of status in older as contrasted with younger children, it is essential that findings be given for specific age and sex groups, and given separately for deciduous and permanent teeth.

A second major consideration which influences the choice of methods of presenting the findings concerns the fact that dental

caries is a cumulative disease. A precise description of status of the disease in a population group requires, therefore, a quantitative evaluation of the *complete caries experience*. Such an evaluation requires a full consideration of what may be termed *past* and *present* caries. Present caries may be defined as actual carious lesions which are present in the mouth at the time of examination. The term past caries may be used in designating those teeth that are filled and those that are missing (extracted) because of caries. For purposes of precision and brevity, the term DMF is introduced and used in this paper, therefore, to designate the complete caries experience. This measurement of complete caries experience, DMF, is obtained readily for the permanent teeth since missing permanent teeth which constitute a part of the caries experience of children may be considered, at least for purposes of the present discussion, as the result of severe caries. An equivalent measurement of the complete caries experience in the deciduous teeth is not possible in the

Table 1. Numbers of children examined, total numbers of permanent teeth erupted, numbers of permanent teeth erupted per 1,000 children, numbers of deciduous teeth present in the mouth, and the numbers of deciduous teeth present in the mouth per 1,000 children, by specified ages.

Age (Last Birthday)	Numbers of Children Examined	Numbers of Permanent Teeth Erupted	Numbers of Permanent Teeth Erupted per 1,000 Children	Numbers of Deciduous Teeth Present in Mouth	Numbers of Deciduous Teeth Present in Mouth per 1,000 Children
6	327	1,594	4,874.6	5,384	16,464.8
7	403	3,361	8,339.9	5,523	13,704.7
8	487	5,473	11,238.2	5,362	11,010.3
9	493	6,947	14,091.3	3,887	7,884.4
10	529	9,194	17,380.0	2,733	5,166.4
11	531	11,500	21,657.2	1,180	2,222.2
12	596	14,611	24,515.1	602	1,010.1
13	545	14,446	26,506.5	202	370.6
14	364	9,897	27,189.6	58	159.3
15	141	3,864	27,404.3	9	63.8
All Ages	4,416	80,887	18,316.8	24,940	5,647.6

data collected since a definite decision may not be made as to whether a missing deciduous tooth has or has not been carious. These latter considerations emphasize again that quantitative facts regarding dental caries in children should be presented separately, and in different ways, for the deciduous and permanent dentitions.

Total Caries Experience (DMF) in the Permanent Teeth. The findings to be presented on the status of caries experience are derived from data on a population of approximately 80,000 erupted permanent teeth in 4,416 grade school children.[4] At this point it may be stated again, that although part of the total caries experience is

Table 2. Numbers of children with one or more DMF[1] permanent teeth, numbers of children with one or more DMF permanent teeth per 1,000 children, numbers of DMF permanent teeth, numbers of DMF permanent tooth surfaces, numbers of DMF permanent teeth, and numbers of DMF permanent tooth surfaces per 1,000 children; by specified ages.

Item Tabulated	Age (Last Birthday)										All Ages
	6	7	8	9	10	11	12	13	14	15	
Numbers of Children With One or More DMF Permanent Teeth	52	146	260	348	414	435	523	495	347	136	3,156
Numbers of Children With One or More DMF Permanent Teeth per 1,000 Children	159.0	362.3	533.9	705.9	782.6	819.2	877.5	908.3	953.3	964.5	714.7
Numbers of DMF Permanent Teeth	95	293	583	994	1,329	1,510	2,179	2,478	1,898	913	12,272
Numbers of DMF Permanent Tooth Surfaces	125	406	835	1,864	2,575	2,758	4,255	5,068	3,854	2,013	23,753
Numbers of DMF Permanent Teeth per 1,000 Children	1,826.9	2,006.8	2,242.3	2,856.3	3,210.1	3,471.3	4,166.3	5,006.1	5,469.7	6,713.2	3,888.5
Numbers of DMF Permanent Tooth Surfaces per 1,000 Children	382.3	1,007.4	1,714.6	3,780.9	4,867 7	5,194.0	7,139.3	9,299.1	10,587 9	14,276.6	5,378.8

[1] DMF, as defined in the text.

[4] Details of the respective caries experience of the two sexes may be found in a recent publication: Klein, Henry; Palmer, C. E.; and Knutson, J. W.: Studies on Dental Caries: 1. Dental Status and Dental Needs of Elementary School Children. *Public Health Reports*, May 13, 1938, 53, No. 19, pp. 751-765.

represented by teeth restored to physiological function through the placement of fillings, the total DMF surfaces represent, in essence, the total number of tooth surfaces which show objective evidence of attack by caries. Accordingly, counts of such surfaces constitute a census of the density of the dental caries problem in a population of teeth, or in a population of children. Details of the caries experience in the children examined, expressed in terms of DMF teeth and surfaces per 1,000 children, are given in Tables 1, 2, 3, and 4.

These tabulations (Table 2) indicate that caries has attacked one or more permanent teeth in 159 out of each 1,000 six-year-old children. As age increases, more children become affected by the disease until, for the age group 15 years, 964.5 of each 1,000 children show evidence of attack by dental caries. Somewhat parallel increases with age are apparent in DMF teeth and DMF tooth surfaces. Each 1,000 children in the age group 6 years have 382.3 permanent tooth surfaces with evidence of caries attack; those of 7 years, 1,007.4; those of 8 years, 1,714.6. Thus the caries attack rates for permanent tooth surfaces increase progressively with age increase until, at age 15, each 1,000 children have 14,276.6 surfaces showing evidence of attack by the carious process.

The different kinds of permanent teeth which contribute to the caries attack rates are indicated in Table 3, which gives, by specified corresponding pairs of teeth,[5] the observed numbers of surfaces and the numbers of these per 1,000 children, showing evidence of attack by caries. As is clearly indicated in this table, of the total of 5,378.8 surfaces with evidence of attack by caries in each 1,000 children, 4,178.9, or 77.7 per cent, are located in the first molar teeth. Of the surfaces attacked in the lower jaw, 87.3 per cent are in the lower first molars. Study of the data given in this table indicates further details concerning the types of teeth which contribute the major

5 The data are presented for corresponding teeth since caries occurrence is bilaterally equal.

proportion of carious surfaces. For example, 4,878, or nearly 91 per cent, of all DMF surfaces in the permanent teeth of each 1,000 children are found in the upper and lower first molars, the lower second molars, and the upper central and lateral incisors. Other details regarding the location of caries attack in the permanent teeth are

Table 3. Numbers of DMF[1] permanent tooth surfaces, numbers of DMF permanent tooth surfaces per 1,000 children, and per cents of DMF permanent tooth surfaces; contributed by specified teeth. Children 6 to 15 years of age, all ages.

Corresponding Teeth	Numbers of DMF Permanent Tooth Surfaces	Numbers of DMF Permanent Tooth Surfaces per 1,000 Children	Per Cents of DMF Surfaces Contributed by Specified Teeth
Upper Jaw			
Central Incisors	1,197	271.1	12.3
Lateral Incisors	871	197.2	8.9
Canines	69	15.6	0.7
First Premolars	512	115.9	5.3
Second Premolars	472	106.9	4.8
First Molars	6,222	1,409.0	63.9
Second Molars	394	89.2	4.0
All Teeth	9,737	2,204.9	100.0
Lower Jaw			
Central Incisors	150	34.0	1.1
Lateral Incisors	107	24.2	0.8
Canines	8	1.8	0.1
First Premolars	101	22.9	0.7
Second Premolars	397	89.9	2.8
First Molars	12,232	2,769.9	87.3
Second Molars	1,021	231.2	7.3
All Teeth	14,016	3,173.9	100.0
Both Jaws			
Central Incisors	1,347	305.0	5.7
Lateral Incisors	978	221.5	4.1
Canines	77	17.4	0.3
First Premolars	613	138.8	2.6
Second Premolars	869	196.8	3.7
First Molars	18,454	4,178.9	77.7
Second Molars	1,415	320.4	6.0
All Teeth	23,753	5,378.8	100.0

[1] DMF, as defined in the text.

Specified Tooth Surface	Numbers of DMF Permanent Tooth Surfaces	Numbers of DMF Permanent Tooth Surfaces per 1,000 Children	Per Cents of DMF Surfaces Contributed by Specified Surfaces
Occlusal	10,215	2,313.2	43.0
Mesial	4,102	928.9	17.3
Distal	3,355	759.7	14.1
Buccal	3,127	708.1	13.2
Lingual	2,954	668.9	12.4
All Surfaces	23,753	5,378.8	100.0

[1] DMF, as defined in the text.

Table 4. Numbers of DMF[1] permanent tooth surfaces, numbers of DMF permanent tooth surfaces per 1,000 children, and per cents of DMF surfaces; contributed by specified surfaces. Children 6 to 15 years of age, all ages.

shown in Table 4 which gives the observed numbers and the numbers per 1,000 children, and the per cents of DMF surfaces contributed by specified tooth surfaces. From data given in this table, it may be noted that 43 per cent of the 5,378.8 DMF surfaces in each 1,000 children are found in occlusal surfaces, 31 per cent in distal and mesial surfaces, and 26 per cent in buccal and lingual surfaces. Thus almost one-half of all tooth surfaces affected by caries experience are occlusal surfaces.[6]

ANALYSIS

The Yearly Increment. The data previously presented afford detailed definition of the frequently encountered impression that defects due to dental caries in children constitute a health problem of major proportions. Analysis[7] of the constitution of this problem

[6] Data given here must not be interpreted as measuring the relative susceptibility of the various teeth and surfaces to attack by caries. In explanation of this caution it need only be pointed out, as an example, that the first molar teeth contribute a large proportion of the total caries experience primarily because these teeth have erupted into the mouth of nearly all of the 4,416 children examined while the second molars, for instance, have erupted into the mouths of a much smaller proportion of children.

[7] For the purpose of the immediate discussion, caries experience is considered without regard for the fact that some of this experience may have been treated by fillings. This facilitates the analysis since the question under discussion concerns the details of the accumulation of *caries attack experience*. Thus from the viewpoint of the analysis, a filled tooth represents a tooth which has been attacked by caries.

is considerably facilitated when an examination is made of the manner in which caries experience accumulates in the permanent teeth.

The observed caries experience (number of DMF permanent tooth surfaces) of children six years of age may be viewed as an accumulation of caries attack experience which has been added each year up to age 6. The number of DMF surfaces found at 7 years of age may be considered equal to that which has accumulated to age 6 plus the *increment* of new defects which have appeared between the sixth and seventh years of age. For example, in each 1,000 of the six-year-old children examined, 382.3 DMF surfaces were found to have accumulated in the permanent teeth. In each 1,000 of the seven-year-old children, 1,007.4 DMF surfaces were observed. The difference in caries experience between the two age groups is, therefore, 625.1 DMF surfaces. This last figure represents the increase or increment of new caries experience which appeared between the sixth and seventh years for each 1,000 children. From this point of view a total yearly increment of caries experience for the entire elementary school population may be visualized as equal to the sum of annual increments for each age group from 6 through 15 years. Such a total yearly increment may be interpreted as a reasonably accurate measurement of new carious defects which may be expected to appear each year in the population of school children. Estimates[8] of the increments for each separate age group, each expressed per 1,000 children, are shown in Table 5. From these data it may be shown that approximately 1,400 new carious tooth surfaces represent the estimated increment of new defects which may be expected to appear in the permanent teeth of each 1,000 of the representative group of elementary school children studied. This annual increment, totaling approximately 6,000 carious surfaces

[8] It is appreciated by the authors that some influence in depressing the tendency towards new caries or extensions of caries may be contributed by the process of filling carious teeth. This perspective will be discussed more fully in a later section of this paper.

Item Tabulated	Age (Last Birthday)										All Ages
	6	7	8	9	10	11	12	13	14	15	
Numbers of DMF Permanent Tooth Surfaces Observed per 1,000 Children	382.3	1,007.4	1,714.6	3,780.9	4,867.7	5,194.0	7,139.3	9,299.1	10,587.9	14,276.6	—
Expected Number of new DMF Surfaces Between Age Specified and Previous Age, per 1,000 Children	382.3	625.1	707.2	2,006.3	1,086.8	326.3	1,945.3	2,159.8	1,288.8	3,688.7	1,427.7[2]

[1] DMF, as defined in the text.
[2] Average weighted for observed number of children in separate age groups.

Table 5. Statistics for the calculation of yearly increments of new DMF[1] permanent tooth surfaces, by specified ages.

for the entire grade school population of 4,416 children at Hagerstown, would account for the fact that 23,753 permanent tooth surfaces with caries experience were actually observed in the total number of children surveyed. Expressed in more general terms, the analysis indicates that a representative group of grade school children have an average of nearly five and one-half carious permanent tooth surfaces per child (23,753 DMF surfaces in 4,416 children) and that this accumulation of defective surfaces is maintained, as new children enter and leave the school group, by a yearly increase of approximately one and one-third new carious surfaces per child per year (approximately 6,000 new DMF surfaces per year in 4,416 children).

Thus from the perspective of this analysis the dental caries problem of school children may be visualized as representing, in essence, the results of an accumulation of yearly increments of carious defects which originate sometime after the teeth erupt into the mouth and as the children progress from lower to higher school grades. It would seem to follow, therefore, that the basic problem of providing care for carious defects in the permanent teeth in school children may well be a problem of caring for yearly increments of defects.

Item Tabulated	Age (Last Birthday)										All Ages
	6	7	8	9	10	11	12	13	14	15	
Numbers of Children Having One or More Filled Deciduous Teeth per 1,000 Children	97.9	91.8	63.7	60.9	90.7	45.2	10.1	7.3	2.7	—	48.2
Numbers of Filled Deciduous Teeth per 1,000 Children	293.6	240.7	176.6	140.0	209.8	84.7	13.4	9.2	2.7	—	117.3
Numbers of Filled Deciduous Tooth Surfaces per 1,000 Children	464.8	344.9	269.0	170.4	296.8	128.1	20.1	9.2	2.7	—	169.6
Numbers of Filled Deciduous Teeth per 1,000 Decayed Deciduous Teeth	60.4	49.2	36.5	38.5	89.4	77.6	28.2	56.8	32.3	—	52.1
Numbers of Filled Deciduous Tooth Surfaces per 1,000 Decayed Deciduous Tooth Surfaces	48.2	33.6	25.0	21.8	59.7	55.4	18.8	23.9	13.7	—	35.3

Table 6. Status of filled teeth in the deciduous dentition, by specified ages.

Fillings in the Permanent and Deciduous Teeth. The data on caries experience presented earlier in this paper indicate that all except a very small segment of a representative elementary school population are affected by caries attack in the permanent teeth. It is of some interest, therefore, to study the distribution of fillings (evidence of dental care) in the teeth of the children examined. Accordingly, Tables 6 and 7 give data on fillings in the permanent and the deciduous dentitions. Among each 1,000 children examined, 222.6 children were found to have had one or more permanent teeth filled. Of each 1,000 DMF permanent teeth observed, 264 had been filled. Of each 1,000 DMF surfaces encountered, 180.3 were filled. It follows, therefore, that less than 20 per cent of the observed DMF surfaces were found to contain fillings.

In the deciduous dentition an observed total of 518 teeth were filled in 213 children. It is thus apparent that in all of the children examined less than one-fifth of the permanent tooth surfaces which

Item Tabulated	Age (Last Birthday)										All Ages
	6	7	8	9	10	11	12	13	14	15	
Numbers of Children Having One or More Filled Permanent Teeth per 1,000 Children	18.3	29.8	100.6	156.2	221.2	288.1	333.9	374.3	335.2	312.1	222.6
Numbers of Permanent Teeth Filled per 1,000 Children	39.8	62.0	255.9	432.0	655.9	856.9	1,147.7	1,412.8	1,244.5	1,212.8	733.9
Numbers of Permanent Tooth Surfaces Filled per 1,000 Children	52.0	67.0	250.5	553.8	854.4	1,113.6	1,585.6	1,882.6	1,659.3	1,595.7	969.7
Numbers of Filled Permanent Teeth per 1,000 DMF[1] Permanent Teeth	136.8	85.3	188.7	214.3	261.1	301.3	313.9	310.7	238.7	187.3	264.1
Numbers of Filled Permanent Tooth Surfaces per 1,000 DMF[1] Permanent Tooth Surfaces	136.0	66.5	146.1	146.5	175.5	214.3	222.1	202.4	156.7	111.8	180.3
Numbers of DMF[1] Permanent Filled Tooth Surfaces per 1,000 DMF[1] Permanent Tooth Surfaces Among Children Having One or More Filled Permanent Teeth	944.4	900.0	721.9	705.4	657.0	615.0	558.5	529.1	447.1	412.1	550.3
Numbers of DMF[1] Permanent Tooth Surfaces per 1,000 Children Having One or More Filled Permanent Teeth	3,000.0	2,500.0	3,449.0	5,026.0	5,880.3	6,281.0	8,502.5	9,504.9	11,073.8	12,409.1	7,915.6
Numbers of DMF[1] Permanent Tooth Surfaces Filled per 1,000 Children Having One or More Filled Permanent Teeth	2,833.3	2,250.0	2,489.8	3,545.5	3,863.2	3,862.7	4,748.7	5,029.4	4,950.8	5,113.6	4,356.1

[1] DMF, as defined in text.

Table 7. Status of filled teeth in the permanent dentition, by specified ages.

have been affected by caries experience show objective evidence of reparative treatment, and that a much smaller proportion of carious deciduous teeth present show similar evidence of treatment.

An analysis of DMF surfaces in the permanent teeth of those

children who have one or more fillings in the permanent teeth shows (Table 7) the presence of 7,915.6 DMF surfaces in each 1,000 of these children. Since this table also shows that a total of 4,356.1 permanent tooth surfaces are filled in each 1,000 of these children, it is revealed that reparative treatment has been supplied for 55 per cent of the DMF surfaces in this particular group. This selected analysis of the distribution of reparative treatment in children having evidence of one or more fillings indicates that a relatively small group of children (actually 983 children out of the total of 4,416) receive all the dental reparative treatment, yet only one-half of their dental filling needs are supplied. Out of the total 4,416 children examined, 3,156 have one or more permanent teeth showing a history of caries (Table 2). Of these, 2,173 exhibit no evidence of treatment for their carious defects. The conclusion may be reached, therefore, that approximately one-half of the carious defects in the permanent teeth are treated in one-fifth and all such defects are neglected in one-half of the 4,416 grade school children.

Present Dental Needs. For the purposes of the present analysis the term dental needs is applied to include those professional requirements which are directly and obviously the immediate consequence of attack by dental caries. Under this definition tooth defects which make up dental needs are contributed by present unfilled caries in the deciduous and permanent dentitions.

Table 8 presents details concerning the number of deciduous and permanent teeth and tooth surfaces requiring fillings. In each 1,000 children examined, 528, or nearly 53 per cent, have one or more unfilled carious deciduous teeth. It may be shown, also, that of each 1,000 deciduous teeth present in the mouth, 398 have unfilled cavities which involve 850 tooth surfaces. Nearly 40 per cent of the deciduous teeth present, therefore, contain unfilled cavities.

In the permanent dentition the conditions which broadly constitute dental needs include all teeth with clinical histories which

Item Tabulated per 1,000 Children	Age (Last Birthday)										All Ages
	6	7	8	9	10	11	12	13	14	15	
Numbers of Children Having One or More Carious Deciduous Teeth Requiring One or More Fillings	810.4	861.0	893.2	862.1	741.0	450.1	245.0	97.2	63.2	42.6	527.9
Numbers of Children Having One or More DMF Permanent Teeth Requiring One or More Fillings	140.7	340.0	464.1	596.3	621.9	657.3	708.1	726.6	815.9	858.2	592.6
Numbers of Deciduous Teeth Requiring One or More Fillings	4,862.4	4,890.8	4,837.8	3,636.9	2,347.8	1,092.3	476.5	161.5	85.2	56.7	2,251.6
Numbers of DMF Permanent Teeth Requiring One or More Fillings	247.7	642.7	940.5	1,484.8	1,654.1	1,781.5	2,206.4	2,622.0	3,453.3	4,517.7	1,809.1
Numbers of Deciduous Tooth Surfaces Requiring Fillings	9,648.3	10,275.4	10,763.9	7,807.3	4,975.4	2,312.6	1,068.8	383.5	200.5	177.3	4,798.7
Numbers of DMF Permanent Tooth Surfaces Requiring Fillings	315.0	806.5	1,213.6	2,324.5	2,552.0	2,570.6	3,263.4	4,056.9	4,969.8	6,787.2	2,672.6
Numbers of DMF Permanent Teeth Missing (Extracted)	3.1	27.3	43.1	129.8	245.7	258.0	352.3	565.1	615.4	801.4	276.0
Numbers of DMF Permanent Teeth With Remaining Roots	—	—	8.2	52.7	49.1	49.0	109.1	111.9	186.8	383.0	74.7

Table 8. Status of teeth requiring fillings in the deciduous and permanent dentitions, by specified ages.

indicate untreated defects due to caries. The conditions which fall into this category are actual unfilled cavities, remaining roots, and missing permanent teeth. These several items are tabulated in Table 8. The section of this table giving the numbers and per cents of children having one or more unfilled cavities in the permanent teeth shows that as age advances the proportion of children having such cavities increases. Further analysis of these data indicate that approximately 77 per cent of all teeth giving a clinical history of caries must be considered in a broad discussion of the prob-

lem of dental needs in the permanent dentition of grade school children.

Summarizing the present dental needs for both dentitions, it is found that each 1,000 children have approximately 2,200 deciduous and 1,800 permanent teeth which show unfilled cavities. Defects in these 4,000 teeth in each 1,000 children affect approximately 4,800 deciduous and 2,700 permanent tooth surfaces. In addition to these defective untreated surfaces, 350 permanent teeth in each 1,000 pupils have been lost because of severe caries.

Dental Needs and Dental Care—the Permanent Teeth. On the basis of the previously presented analysis, it becomes of some interest to relate the yearly increment of new defects previously discussed to an analogous estimate of the amount of care now given each year for carious defects in the permanent teeth of the children. Such an estimate of dental care may be obtained by the same method of analysis as was used to determine the total yearly increment of new defects requiring fillings. Basic data which may be used for the calculation of an annual increment of filled surfaces are given in Table 7. The analysis, although not shown in detail here, indicates that the filling of approximately 230 permanent tooth surfaces per year per 1,000 children would result in the finding of the 4,282 filled surfaces in the 4,416 Hagerstown children at the time of the survey. Since, as was shown in Table 5, approximately 1,400 (1,427.7) permanent tooth surfaces develop caries each year in each 1,000 of the grade school population it becomes apparent immediately that the filling of permanent tooth surfaces is being accomplished at a rate which is about one-sixth as large as the rate at which the defects are accruing. Identification of this disparity between the rate of development of defects and the rate of placement of fillings largely explains, in quantitative terms, the existence of the present accumulated dental *needs* of the children and leads to the conclusion that if such accumulation of untreated defects in the permanent teeth is to be avoided in the future some provision

should be made to give elementary school children (in the form of fillings in the permanent teeth alone) approximately six times the amount of dental professional service they now receive.[9]

An Estimate of the Order of Professional Facilities Required to Care for the Dental Needs in the Permanent Teeth of Grade School Children. The data presented in previous sections of this paper on material collected from Hagerstown, Maryland, furnish information which may be used as a basis for estimating the order of professional dental facilities required to care for certain basic dental needs of the grade school children. There were, at the time of the survey, thirty-two practicing dentists in Hagerstown, which has a total population of approximately 32,000 persons and an elementary grade school population of approximately 4,700 children. For present purposes the estimations of professional dental service required to care for the dental needs of school children may be based, therefore, on a ratio of one dentist to each 1,000 of the total population and of one dentist to each 150 of the grade school population.

Although it is undoubtedly true that some dentists allocate more time for the treatment of children than others, a number of immediately useful results in the present analysis may be achieved by expressing estimates of dental service for children in terms of an assumed equal distribution of professional time. These estimates are based on the following subsidiary postulates: First, that each dentist of the community would need to care for the defects in the permanent teeth of 150 grade school children. Second, that each dentist may choose to work 1,800 hours per year.[10] Third, that one hour of professional time would be required to care adequately for each defective permanent tooth surface.[11]

9 This figure is estimated without taking into account the dental needs of the deciduous dentition or the care required for remaining roots, missing teeth, and other conditions.

10 This estimate of working hours per year is used by Strusser. (*See* bibliographic reference [25]).

11 It is recognized that the location of surfaces to be filled may considerably influence the

(Continued on page 283)

From the data given in a previous section of this paper, it may be shown that, at the present time, of the order of thirty-four defective permanent tooth surfaces are filled per dentist per year in the permanent teeth of each 150 grade school children. This estimate of service now given the school children, thirty-four surfaces per year per dentist, means that less than 2 per cent of the total professional time of each dentist is devoted to the filling of permanent teeth in that 15 per cent of the population which attends the elementary schools.

On the basis of the estimate that approximately 1,400 new carious surfaces develop in each 1,000 grade school children each year (214 new carious surfaces in each 150 grade school children), it may be postulated that in order to prevent the accumulation of untreated defects,[12] with the dental professional facilities available, services equivalent to the filling of the order of 200 surfaces per year per dentist would be required. The treatment of this number of surfaces by each dentist means that approximately 10 per cent of the professional time, available in the community as a whole, would be required to give dental care sufficient to *prevent* the accumulation of defects in the permanent teeth of the grade school children.

An attempt to care, during the course of one calendar year, for the present accumulation of 2,700 defective surfaces[13] in the permanent teeth of each 1,000 children would make it necessary for each dentist, in taking care of 150 children, to fill approximately 400 permanent tooth surfaces. This amount of work by each dentist would involve approximately 20 per cent of the time available from

time required for placing fillings or for providing other indicated treatment. Since the immediate purpose of this discussion is chiefly the dissection of the problem of supplying dental needs due to caries, the estimates of professional services required are arbitrarily stated. Thus, if more or less than one hour be estimated for the treatment of each carious surface, the total services required would be proportionately changed.

[12] It may be emphasized again that the care of yearly increments may be expected to considerably reduce the size of the yearly increments themselves by the prevention of extension of caries.

[13] No provision being made to restore missing permanent teeth or to extract and restore remaining roots.

the professional men in the community. In connection with this last estimate if an attempt were made to care during one calendar year for the present accumulation of defects, plus those defects which it is estimated would accrue during that year, it may be postulated that approximately 600 permanent tooth surfaces would need to be filled during the course of the year by each dentist, a task which is estimated to require approximately one-third[14] of the professional time of the dental practitioners.

The above summary, although obviously based on arbitrary estimates of professional time requirements for the placement of fillings, provides some clarification of the quantitative characteristics of the problem of supplying dental services for the permanent teeth of school children.[15] It seems necessary to conclude, first, that the magnitude of the present accumulation of dental needs in the permanent teeth alone is of such order as to make difficult its immediate practical handling with existing facilities. Second, it seems reasonable to expect, and desirable to suggest, that provision should be made for handling the yearly increment, the care of which, alone, is estimated to require approximately 10 per cent of the professional time of the dental practitioners. Third, care for the yearly increase in new defects, alone, appears to involve more than a sixfold increase over the time now given to the filling of permanent teeth in the school children.[16]

[14] This amount of professional service required by the grade school children for defects in their *permanent teeth alone* obviously might seriously tax the professional dental services available for the adult population.

[15] An equivalent analysis of the problem of supplying care for the deciduous teeth is difficult, since in many instances the short life expectancy of these teeth does not justify extensive reparative dental work. It is appreciated, of course, that a considerable amount of professional service is necessary if the deciduous teeth are to be given adequate dental care.

[16] Estimates of professional requirements for the care of dental defects in school children may be expected to vary with variations among localities in the ratio of dentists to the population, as well as with variations among localities in the density of the caries experience. Since, for the United States as a whole, a ratio of approximately one dentist to each 2,000 of the total population obtains, the estimates of professional services required to care for dental needs of school children would be changed proportionately if the results of this study were to be applied to the country generally.

SUMMARY

1. Detailed findings of the caries experience of a representative grade school population of approximately 4,400 children are presented in tabular form.

2. Analysis of these findings indicates that dental needs in grade school children represent, in essence, an accumulation of neglected yearly increments of attack by caries.

3. It is indicated that new dental carious defects accrue in the permanent teeth each year at a rate which is approximately six times the rate at which fillings are placed.

4. It is estimated that the care of the yearly increment of carious defects in the permanent teeth of the elementary school children would involve approximately 10 per cent of the professional services available in the community studied.

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SOCIAL AND ECONOMIC PROBLEMS IN THE CONTROL OF TUBERCULOSIS[1]

by BAILEY B. BURRITT[2]

TUBERCULOSIS tends to undermine the economic stability of families. The high incidence of tuberculosis from ages 20 to 40, the most productive years of life and the years in which family responsibilities are heaviest, is an important factor. The long-continued duration of the disease is another important factor. Every person working in the field of tuberculosis is aware of the economic problem of the tuberculous. However, little precise and definite information bearing on this phase of the problem has been assembled. It seems appropriate, therefore, to present some data available from the experience of the Association for Improving the Condition of the Poor concerning the social and economic problems in the control of tuberculosis.

TUBERCULOUS FAMILIES IN SYRACUSE

A study made by the New York Association for Improving the Condition of the Poor of the relief of tuberculous families in the City of Syracuse in 1928, with the support of the Milbank Memorial Fund, gave some significant facts. Of 1,288 families known to the Health Department of Syracuse at that time, 296 families, or 22.9 per cent, were classed as economically stable families. The remaining 992 families (77 per cent) either availed themselves of the free health or social services of the community or of both services, or, if they failed to do this, were regarded as requiring such care or relief. This study was concerned primarily with the adequacy of relief, and it demonstrated that the amount of relief was for the most part temporary and of an emergent character; was inadequate in amount

[1] Presented at the Round Table on Tuberculosis, Sixteenth Annual Conference of the Milbank Memorial Fund, March 29-31, 1938.

[2] From the New York Association for Improving the Condition of the Poor.

in nearly all families; was for the most part given in the form of grocery orders and relief in kind not carefully related to the needs of the family; and that the dispensing of relief was not in the hands of personnel with sufficient training to accomplish the best results.

FAMILIES IN MULBERRY DISTRICT, NEW YORK CITY

More recently the A.I.C.P. has been making a special study of tuberculosis in the Mulberry District of New York City. While this study is being conducted among families supervised by the City Department of Health and the Mulberry Health Center mainly for the purpose of exploring the relative advantages and costs of different methods of discovering new cases of tuberculosis, some data have been asssembled with regard to the social and economic condition of these families. The important findings from these records have been put together under the supervision of Miss Jean Downes and are as follows:

During the past year (1937) eighty-four families, including 379 individuals, in which there was or had been recently an active case of adult pulmonary tuberculosis, were given public health supervision. The frequency of occurrence of certain social and economic conditions among these eighty-four families may be compared with similar conditions among 494 families composed of 3,056 individuals supervised because a child in the family was found to have tuberculous infection or childhood tuberculosis.

The living conditions in respect to housing are so uniform in the district, and the range of the income level of the families is so limited, that important differences between the two groups of families were noted in only three aspects.

1. In 87 per cent of the 494 families (those supervised because of infection or childhood type tuberculosis), both the husband and wife were a part of the present household. This was true for only 45 per cent of the eighty-four families where there had recently been an active case of adult pulmonary tuberculosis. In the eighty-four

families the husband or wife was out of the household chiefly because of death. Death of the husband as a cause of broken families occurred four times as frequently as death of the wife.

2. Fewer persons per family were noted among the eighty-four families because of the high proportion of broken families among them. Consequently, the index of crowding was lower for this group, that is, fewer persons per room. In 43 per cent of these families there was one or less than one person per room contrasted with only 14 per cent with similar conditions among the 494 families in which there was no adult pulmonary tuberculosis.

3. Twenty-eight per cent of the husbands (living) in the families where there had been adult pulmonary tuberculosis were unemployed during 1937 contrasted with only 12 per cent of the husbands in this class in the 494 families supervised because of infection or childhood type tuberculosis.

Both groups of families were similar in respect to employment of the wife, amount of rent, relief status, and income.

In approximately 30 per cent of the families in each group the wife was a wage-earner, and in only 4 per cent of the families was she a part-time wage-earner doing the type of work that could be brought into the home.

The amount of rent paid per month was similar for both groups of families. About 36 per cent paid less than $20 per month, and slightly less than 80 per cent paid less than $30 per month.

When the relief status of the family is considered, again the findings are strikingly similar for both groups of families. Fifty-four per cent of the eighty-four families in which there was recently an active case of adult pulmonary tuberculosis had some form of relief or assistance during 1937. Fifty-one per cent of the 494 families supervised because of tuberculous infection in a child in the family fell into the same category.

In this particular study, income is considered in relation to a minimum budget for families set up by the Association for Improv-

ing the Condition of the Poor. This budget makes no provision for medical, dental, and oculist services, vacations, recreation, or savings for emergencies, but includes food, rent, fuel and light, and clothing. Carfare is also included for working members of the family. On the basis of all income in the family, the per capita income per year either above or below the minimum budget has been calculated for each family. Putting the income on a per capita basis takes into account the size of family or household, and relating income in such a manner to a subsistence budget affords perhaps the most accurate picture of the real level of living of these families.

Including the families which had some form of relief or assistance during 1937, 62 per cent of the eighty-four adult pulmonary families had an annual per capita income below the minimum budget. Fifty-six per cent of the 494 families (infection and childhood type tuberculosis) also had an annual per capita income below the minimum budget. The annual per capita amount necessary to bring the families in both groups up to the level of the minimum budget varied from $15 to $115.

If the families receiving relief or some form of assistance be excluded, 32 per cent of the families in both groups had an income below the minimum budget requirements. The per capita amount needed in these families annually varied from $15 to $115 per year. For those families having an annual income above the minimum budget, the per capita amount above the budget was predominantly within a limited range, namely, from $1 to $35 per person per year.

It is evident from these data concerning income that the general level of living for the families in the Mulberry District is low. Even with assistance, a high proportion had an income inadequate for even the minimum budget including only food, rent, fuel, light, and clothing.

It is apparent also that certain social and economic problems are apt to be more acute in families where there is or has recently been an active case of adult pulmonary tuberculosis. Absence of the hus-

band or wife because of death occurred more frequently among such families, and a higher proportion of the living husbands in these families was unemployed.

INCOME OF FAMILIES IN A.I.C.P. TUBERCULOSIS FAMILY DIVISION

Another group of facts bearing on the economic and social instability of tuberculous families is shown by an analysis of the income of 566 families including 2,454 individuals known to the Tuberculosis Family Division of the Association for Improving the Condition of the Poor in March, 1938.

These data shown in Table 1 give facts with regard to 566 families containing 2,454 individuals under the care of the Tuberculosis Family Division of the New York Association for Improving the Condition of the Poor in March, 1938. It will be noted that 274 of the 566 families had no earnings; 61 of the families, on the other hand, earned the full minimum standard budget deemed necessary by the Association. The total earned income of all these families was $21,789 for the month of March, and the budget deficit totaled $25,120. The budget deficit per family varied from $16.93 to $123.42

Table 1. Study of income of 566 families known to the Association for Improving the Condition of the Poor, Tuberculosis Family Division, March, 1938.

Number of Individuals in Family	Number of Families	Total Individuals	Number of Families Earning Full Budget	Families With No Earnings	Total A.I.C.P. Budget	Members of Families Earned	Income Deficit	Average Deficit per Family
1	57	57	1	50	$2,139.72	$ 265.65	$1,874.07	$32.88
2	77	154	7	48	4,512.44	1,478.02	3,034.42	39.41
3	81	243	6	43	5,608.60	2,580.23	3,028.37	37.39
4	117	468	7	49	9,270.38	4,271.00	4,999.38	42.73
5	96	480	17	38	9,233.12	4,622.42	4,610.70	48.03
6	43	258	8	15	4,474.40	2,383.99	2,090.41	48.61
7	33	231	6	15	3,643.93	1,555.68	2,088.25	63.28
8	28	224	7	7	3,455.75	2,326.15	1,129.60	40.34
9	20	180	1	5	2,531.32	1,265.67	1,265.65	63.28
10	4	40	0	3	524.01	30.33	493.68	123.42
11	5	55	1	1	749.94	455.93	294.01	58.80
12	3	36	0	0	393.08	342.29	50.79	16.93
13	1	13	0	0	154.72	43.33	111.39	111.39
15	1	15	0	0	218.26	168.99	49.27	49.27
Total	566	2,454	61	274	$46,909.67	$21,789.68	$25,119.99	$44.38

with an average deficit per family of $44.38 per month. While this is a selected group of families it does indicate, nevertheless, that tuberculosis tends to precipitate situations which undermine the economic stability of the family, and that this presents a problem that cannot be escaped by those interested in the control of tuberculosis.

Attention should be called also to the fact that in the adequate care of the tuberculous patient and his family much more is involved than the provision of needed income. To make a good adjustment to his disease the tuberculous patient must be taught a new way of living. The tuberculous family must also be re-educated if preventive health measures are to be effective. Too often the patient after completion of a successful period of sanatorium treatment may come back into a home situation which completely nullifies the work of the hospital or at least mars it.

In conclusion, certain general observations concerning the social and economic problems of the tuberculous may be made. They are as follows:

1. Tuberculosis precipitates economic and social problems in the great majority of cases infected.

2. It is quite impossible to arrest and control tuberculosis on a family budget inadequate for the simplest requirements of food, clothing, housing, and the necessities of life, no matter how much effort is spent on medical diagnosis, medical treatment, nursing supervision, or sanatorium and hospital care.

3. There is much waste of the time and efforts of clinic physicians and nursing staff and of expenditures for these services because necessary social services and needed relief for the families treated are not available.

4. Hospital and sanatorium care too often fail in their objectives because there is inadequate attention to the personality of the patients and the social and economic needs of his family. Discharged against the advice of the physician is a very frequent record in

hospitals and sanatoria. We will continue to record these failures until we treat personalities as well as germs, and until we provide needed income and guidance to families of patients.

5. In the main, those responsible for the control of tuberculosis have not accepted the responsibility of insuring adequate attention to the economic and social needs of the family although their efforts to control it in families in which it has been diagnosed are all too frequently made ineffective if not completely futile without this.

6. It is more possible to secure relief for tuberculous families now than previous to 1930. The depression and its extension of public relief has made relief for tuberculous families more possible than it was before.

7. Experience in New York City and elsewhere has demonstrated that it is possible to secure from relief authorities special consideration for tuberculosis cases. This should be urged in all communities.

8. Further amendment of the Social Security Act adding tuberculous families to those eligible for relief with Federal aid should be secured if the alternative plan urged for Federal aid to all families in need is not adopted. This, together with special allowances for tuberculosis, should do much to help solve this problem.

9. In any event, more integrated and coordinated efforts of public health departments, public welfare departments, and hospitals and sanatoria are needed to secure the utmost possible help from present facilities. The problems of tuberculous families are by no means as discrete and separate as our facilities for dealing with them.

RESULTS OF DISTANCE VISION TESTS IN A RURAL POPULATION[1]

by RALPH E. WHEELER, M. D.

DISTANCE vision testing by the Snellen chart is generally included in the health examination and in the school medical examination in particular. A number of studies have been based upon the data secured from routine tests of this sort, but these have largely been limited to certain restricted age or occupational groups and very little has appeared on distance vision testing among rural inhabitants.

The Snellen test chart is the conventional one having nine lines of letters each line containing letters of a single size, the sizes being graded from large (three and one-half inches high) at the top to quite small ones (about one-quarter of an inch high) on the bottom line. The few persons able to read the line with the smallest letters have exceptionally keen vision and are rated 20/10. Not infrequently the next larger line can be read, and individuals able to do this are rated 20/15. The third line from the bottom is here regarded as the limit of normal and is rated 20/20. Those unable to read this last but able to read the fourth or fifth line (20/30 and 20/40, respectively) are here regarded as having moderately defective distance vision. Individuals able to read only the fifth line (20/50) and successively larger types (20/70, 20/100, and 20/200), together with those unable to read even the largest letters (these latter were collectively rated less than 20/200), are regarded as having markedly defective distance vision.

The distance between the test chart and the examinee was always twenty feet, and the vision of each eye was tested and recorded separately. In the group whose data are here discussed, the vision

[1] From the Milbank Memorial Fund.

Acknowledgment is made of the cooperation extended by the Cattaraugus County Department of Health. For material aid in preparing the paper, the author is indebted to Mrs. Mary M. Fowler. Dr. Dorothy Shaad very kindly offered critical comment.

was thus tested first without glasses and subsequently with glasses, where these were worn for distance vision at the time of the clinic visit.[2]

The data presented here were obtained from the medical examination records of a group of persons of all ages in a rural area in Cattaraugus County in western New York State. The characteristics of the area and the method of obtaining a sample of the population for examination are described elsewhere;[3] it suffices here to note that the examinees came from rural farm and small village homes, and included children and adults of both sexes. There are certain selective factors in the group as a whole, but these are regarded as not appreciably affecting the representativeness of the distance vision findings.

Of a total of 1,224 individuals examined, vision data are available on 965. The 258 for whom no record is available were chiefly children under five years of age, so that the earliest age for which examinations were obtained is five years.[4] Of the 966 records, there are 585 upon which data are complete enough for the purposes of the present paper. The factor of selection for completeness of data is not regarded as affecting the representativeness of the smaller sample as the records cover all persons seen at the clinic over a period of nearly three years and, insofar as they may be compared with the data of the discarded records, show no significant differences.

Data are given, then, on the records used here for the visual per-

[2] It was pointed out by Dr. Shaad that, where children wearing glasses are being tested, there is likely to be a period of defective accommodation immediately after putting on glasses, so that vision should be tested *first* with glasses and subsequently without them. Failure to adopt this routine with children may lead to a worse rating for the vision with glasses than the child actually should have.

[3] Wheeler, Ralph E.: Impairments in a Rural Population. The Milbank Memorial Fund *Quarterly*, July, 1937, xv, No. 3, pp. 248-261.

[4] A number of children under five were tested, but even when they were cooperative the results of the test were frequently inconsistent and therefore not recorded. Older children unfamiliar with the alphabet were tested by the Snellen test with E's in various positions. Examinees were observed carefully while the test was in progress to prevent conscious or inadvertent evasions.

formance of each eye separately, and for each eye with and without glasses where these were worn habitually.

Unfortunately, it was not possible to arrange a consultation with an oculist for each case found to have defective distance vision, so that useful information as to the causes of the defects found is not at hand. Only the data on defects from all causes, therefore, may be used.

In a summary study of defects,[5] certain data, chiefly from the findings of the second examiner, were detailed. These reveal a number of facts already established for urban populations but, as far as can be ascertained, not well defined for rural ones. The first is that the percentage of persons with all forms of defective distance vision (20/30 or worse) in one eye or both, and without glasses (where these are habitually worn), rises from 26 per cent at ages 5-14 years to 87 per cent[6] at ages above 60 years. This rise is, of course, to some extent a result of the aging process. The second fact is that males in general show lower rates than females throughout the greater part of the life span.

The previously published data were part of a general discussion of the basic physical findings of a population and did not cover such facts as the extent to which correction of distance vision defects was obtained by glasses or the extent to which there may be inequalities of vision between the two eyes. The present study will complete the earlier data in these respects and draw certain conclusions about the testing of vision as applied to the routine health examination.

The data are here offered on an age- and sex-specific basis because of the variations in prevalence with these two factors. Two categories of defective vision, as measured by the Snellen test, are

5 Wheeler, Ralph E.: Impairments in a Rural Population. IV. Prevalence of Impairments by Age and Sex. The Milbank Memorial Fund *Quarterly*, April, 1938, xvi, No. 2, pp. 192-217.

6 The actual figures were 21.4 per cent for males and 31.2 per cent for females in the youngest age group, and 88.6 per cent for males and 86.1 per cent for females in the oldest age group.

also presented: "All degrees" is a comprehensive one, including both moderate and marked, as defined above: "marked degrees" includes the ratings from 20/50 to less than 20/200. In Table 1, the prevalence of these degrees of defect is shown for the examined group in two ways: the first counts among the defective those with defective vision who were substantially improved by wearing glasses (uniformly without glasses), and the second counts among the defective only those having the respective degree despite the correction of glasses if these were worn (with glasses, when worn). A final column shows the proportions wearing glasses for the correction of distance vision at the time of examination.

Table 1. Percentage of examined persons with all degrees of visual defect measured by the Snellen chart, and with marked degrees only, tested without glasses and with glasses when these were worn.

Age Group	Number Examined	All Degrees[1]		Marked Degrees Only[2]		Per Cent Wearing Glasses[3]
		Uniformly Without Glasses	With Glasses When Worn	Uniformly Without Glasses	With Glasses When Worn	
	MALES					
Total	272	40.4	39.0	23.2	19.1	6.2
5-14	70	21.4	21.4	7.1	7.1	—
15-29	59	22.0	22.0	11.9	11.9	—
30-44	52	30.8	30.8	13.5	11.5	7.7
45-59	47	57.4	51.1	34.0	23.4	17.0
60+	44	88.6	86.4	63.6	52.3	11.4
	FEMALES					
Total	313	49.5	46.0	29.1	21.4	15.0
5-14	74	31.2	31.1	8.1	6.8	1.4
15-29	85	34.1	32.9	22.4	17.6	7.0
30-44	61	44.3	42.6	16.4	11.5	9.8
45-59	57	78.9	70.2	49.1	40.4	29.8
60+	36	86.1	75.0	77.8	47.2	47.2

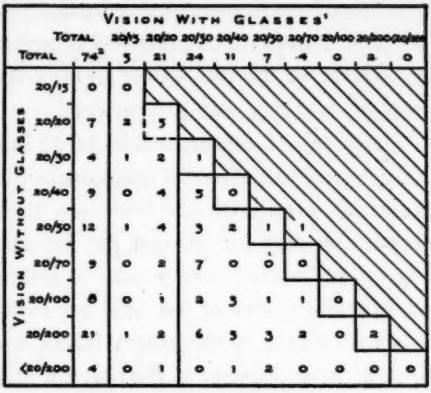
[1] Vision of one or both eyes 20/30 or worse.
[2] Vision of one or both eyes 20/50 or worse.
[3] Wearing glasses for distance vision at the time of clinic examination.

It is evident that, through the greater part of the life span, the factor of correction by the use of glasses does not very materially affect the proportions classed as having defective vision in this rural population. The chief reason for this is, probably, that relatively few persons wear glasses compared to the number in need of them. This must remain a hypothesis because the exact proportion of all defects of distance vision due to refractive errors, and therefore remediable by glasses, is not known. There is a simple test which could and should be added to the routine medical examination of distance vision and which would clarify this uncertainty to some extent, namely, the pinhole test.[7] Unfortunately, however, it was not included in the examining routine of the group whose findings are presented here. However, the differences are not entirely attributable to failure to obtain glasses when needed, for a number of examinees wore glasses but did not secure the maximum benefit from them.

The distribution of all persons wearing glasses when they came to the clinic is shown according to degree of visual acuity, with and without glasses, in Figure 1. This figure shows a number of facts about the degree of correction achieved by wearing glasses for distance vision in this population. The shaded area above the diagonal squares represents distance vision made worse by the wearing of glasses. Only one person appears here. The area within the squares on the diagonal shows the number of persons whose vision, as measured by the Snellen test, was unchanged by wearing glasses. The five persons with 20/20 vision, both with glasses and without,

7 If, by the regular Snellen test, a patient is found to have errors in the neighborhood of 20/30 or worse, the examinee should be given a card with a pin-hole in it and asked to read the Snellen test chart again, with each eye separately sighting it through the pinhole. The test is not an infallible one, but the majority of persons showing improvement of visual acuity with it have correctable refractive errors. Little time is consumed in making this extra test, and the further information it gives on the prognosis of visual conditions alone makes it an important adjunct to the routine. The procedure has long been a part of the ophthalmological examination. For data on the usefulness of this test, as a part of the routine health examination, the author is indebted to Dr. R. Townley Paton and to Dr. Dorothy Shaad.

may have been wearing glasses for astigmatism or some other refractive error not involving central visual acuity, so that only four persons may properly be counted here. The number under the diagonal of squares, showing vision with glasses of 20/30 or worse (to the right of the perpendicular between 20/20 and 20/30), is the group wearing glasses presumably for the correction of defects of distance vision but not achieving full correction; this group numbers forty-three individuals. Those to the left of the perpendicular and including the five having 20/20 vision with and without glasses are the number credited with securing full correction from the wearing of glasses. The percentages which these figures are of the total number wearing glasses are shown in Table 2.



[1] Vision as of one or both eyes.

[2] Ten persons examined with and without glasses, by another examiner, have been included in this table.

Fig. 1. Number of all examined persons wearing glasses for distance vision, having specified vision with and without glasses.

The data shown in Figure I and Table 2 are for the vision of one or both eyes; that is, individuals are rated as having the degree of visual acuity found for the eye with the least vision when there is

Table 2. Number and percentage of persons receiving stated grade of visual aid from glasses.

	Total Wearing Glasses	Unimproved or Made Worse	Somewhat Improved But Not Fully	Fully Corrected (At Least to 20/20)
Number	74	5[1]	43	26
Per Cent	100.0	6.8	58.1	35.1

[1] Excluding five with 20/20 vision where glasses were used apparently to correct astigmatism.

a discrepancy. When individuals are rated as of the visual acuity of the best eye, the figures are somewhat changed. ***Unimproved or made worse*** then becomes 5.4 per cent; ***somewhat but not fully improved*** becomes 36.5 per cent; and ***fully improved*** becomes 58.1 per cent. Possibly the fairest way of presenting these data would be an average of the two sets of figures, when they would read successively 6.1, 47.3, and 46.6 per cent.

The ideal, of course, would be to have glasses, if worn at all, fully correct the defect in question, but such an ideal is not always attainable even with the best care available, and this may well account in part for the not too favorable distribution shown in Figure 1. Another reason may be that glasses were not checked periodically to ensure the need for further correction. This point was not covered by the history taking so that no data are available to confirm or disprove it. Finally, it is known that only a small proportion of persons in the study area secured glasses on the prescription of an oculist, and it is believed that this is also true of the group here presented.

The data previously published[8] for visual findings without glasses are all based upon the findings for one or both eyes, individuals being rated, as in the foregoing correction analysis, on the basis of the vision of the eye with the least vision where there is a discrepancy between the findings in the two eyes. This is probably more justifiable as a mode of presentation in the case of visual defects than it is in the estimation of the extent to which correction has been achieved by the wearing of glasses. There are, however, one or two facts about discrepancies in vision which are revealed by a comparison of the visual performance of the two eyes considered separately. Table 3 shows the percentages of persons with defective distance vision in one eye only or in both. The proportion of persons showing defects in one or both eyes is uniformly greater than that with defects in both eyes because a certain number of persons may have

[8] Wheeler, Ralph E.: *op. cit.*

Age Group	Number Examined	All Degrees		Marked Degrees Only	
		One or Both Eyes	Both Eyes	One or Both Eyes	Both Eyes
	MALES				
Total	272	40.4	29.8	23.2	12.1
5-14	70	21.4	8.6	7.1	—
15-29	59	22.0	10.2	11.9	1.7
30-44	52	30.8	19.2	13.5	3.8
45-59	47	57.4	48.9	34.0	19.1
60+	44	88.6	81.8	63.6	47.7
	FEMALES				
Total	313	49.5	38.1	29.1	23.1
5-14	74	31.2	20.3	8.1	4.0
15-29	85	34.1	24.7	22.4	21.2
30-44	61	44.3	30.0	16.4	8.3
45-59	57	78.9	61.4	49.1	35.1
60+	36	86.1	83.3	77.8	72.2

[1] All percentages based on performance without glasses when these were worn

Table 3. Percentages of examined persons with all degrees of visual defect and marked degrees only, compared as to defects in one or both eyes, and in both eyes only.[1]

a defect in one eye and good or only moderately defective vision in the other. The differences diminish with increasing age because the aging process often affects the vision of the best eye. Evidently, however, these differences are not equally distributed between the two sexes. The differences between rates for one or both eyes and both eyes are not so marked for males and females with all degrees of defect as they are for males and females with marked degrees. Thus, the rate for marked degrees of visual defect in both eyes for males (12.1 per cent) is only half that for one or both (23.2 per cent), while the corresponding rates for females are much more nearly equal (23.1 and 29.1 per cent). As the age distribution of male and female examinees is not dissimilar, the conclusion may be drawn that the more marked degrees of visual defect are more

likely to be bilateral among females. A similar conclusion was reached by Collins[9] from an analysis of Snellen test data for school children.

DISCUSSION AND CONCLUSIONS

The routine medical examination is well designed for detecting pathological form but poorly designed for detecting pathological function. As defects—even serious defects—of function may precede or exist independently of manifest changes in the size, shape, or general appearance of an organ, the medical examination stands badly in need of supplementation with tests of function. The Snellen test is one of the few functional tests already in routine use. It is, unfortunately, not a comprehensive test of vision or even of distance vision, as some persons show a fairly good performance over the short period of the test and have difficulty in using the eyes similarly for a longer period; also, central vision is measured almost exclusively.

The detailed analysis of vision may require more extensive testing than the results would warrant or than the routine examination could accommodate, but the supplementing of the present Snellen test with the pinhole test, mentioned above, would appear to be well worth while, when some degree of visual defect is encountered with the former. Directly or indirectly, defects of vision may have quite as much significance for the individual as other defects whose discovery arouses more apprehension. Cancers of the eye and other serious progressive conditions are, fortunately, rare, but their detection on routine examination requires some supplementing of the usual procedure. One useful supplement is, of course, the ophthalmoscopic examination, but this may not be very satisfactory unless the pupil is dilated—hardly a practical routine measure. The pinhole test will be found useful in such cases, and even the more common disorders can be better diagnosed and recommendations

9 Collins, S. D.: The Eyesight of the School Child as Determined by the Snellen Test. *Public Health Reports*, United States Public Health Service, November 28, 1924, xxxix, No. 48, pp. 3013-3027.

for correction reinforced if the regular Snellen test is supplemented as suggested.

The data on the prevalence of inequality of vision in the two eyes suggests that there is some factor which makes males not only less prone than females to have defective vision but less likely to have it bilaterally in marked degree. The latter fact may be due to the more frequent occurrence of injuries affecting the vision of one eye among males.

The need of adults for efficient distance vision varies with occupation and other considerations, so that the low proportion found in Table 1 to have adequate correction is not necessarily unfortunate. On the other hand, it is very probable that more school children need glasses for correction than have them, according to these figures.

A STUDY OF MORTALITY AMONG INDIVIDUALS WITH ACTIVE PULMONARY TUBERCULOSIS[1, 2]

by JEAN DOWNES

TODAY it is generally recognized that tuberculosis is an infectious disease which frequently results in prolonged disability and often causes premature death. The modern campaign against tuberculosis which includes efforts toward provision of sanatorium facilities for care and treatment of the disease, prevention of the spread of infection in the tuberculous family, and early diagnosis of cases is a forceful acknowledgment of the importance of control of the disease. One of the most striking ways of indicating the seriousness of tuberculosis is to show the risk of mortality for persons with manifest disease. Observation over a period of years of all individuals within a rural area, Cattaraugus County, who were known to have active disease makes it now possible to present the mortality experience for a group of unselected cases.

Drolet has studied the fatality of tuberculosis cases by ascertaining the ratio of deaths to new cases of the disease reported in various communities.[3] However, studies of the mortality of tuberculosis cases have been largely confined to groups of individuals discharged from sanatoria. Hilleboe[4] has pointed out that in only a few of these

[1] From the Milbank Memorial Fund.

[2] Acknowledgments are made to the Cattaraugus County Department of Health for permission to use the records of the Bureau of Tuberculosis, especially to Dr. John H. Korns, director of the Bureau, whose interest and cooperation have contributed to the value of this study; and to the late Dr. W. H. Frost, of The Johns Hopkins University School of Hygiene and Public Health, who gave helpful suggestions and criticisms concerning the analysis and presentation of the data. Acknowledgments are made also to Drs. J. Burns Amberson, R. L. Gauld, Godias J. Drolet, and Selwyn D. Collins for a critical reading of the manuscript.

[3] Drolet, Godias J.: Present Trend of Case Fatality Rates in Tuberculosis. *The American Review of Tuberculosis*, February, 1938, xxxvii, No. 2.

[4] Hilleboe, H. E.: The Comparative Mortality of Patients Discharged from Tuberculosis Sanatoria. *The American Review of Tuberculosis*, December, 1936, xxxiv, No. 6.

studies of post-sanatorium cases has there been adequate follow-up of patients and employment of a precise method of analysis, both of which are essential for an accurate presentation of mortality. The post-sanatorium mortality experience of cases from studies using suitable control populations for comparison has indicated that persons discharged from sanatoria do suffer a mortality considerably in excess of that in the general population. Britten has shown also that policy holders who gave a history of one attack of pulmonary tuberculosis two years or more prior to application for life insurance suffered a death rate from seven to ten times the expected mortality among persons of the same age and sex.[5]

DATA AND METHOD OF STUDY

The data presented in this particular study include essentially all of the active cases of the adult pulmonary form of tuberculosis reported or discovered in the County during the twelve-year period, 1923-1935. A special effort has been made by the Bureau of Tuberculosis of the County Department of Health to follow carefully the progress of every known active case. Those who enter sanatoria outside of the County are reported upon at various time intervals, at least once a year, and those who after arrest of the disease leave the County temporarily or permanently are asked to report upon their condition from time to time. Such a careful follow-up of cases offers data which are unique because of their completeness. Furthermore, for the most part the cases have been classified as to stage and condition of activity at varying time intervals by one person, Dr. John H. Korns, director of the Bureau of Tuberculosis since 1928. This insures a high degree of uniformity as to diagnosis and classification of the cases.

Since it is desired to arrive at an annual rate of mortality among tuberculosis cases, it is necessary to use as a population base the total

5 Britten, Rollo H.: Risk of Mortality among Persons with Chronic Disease. The Milbank Memorial Fund *Quarterly*, October, 1937, xv, No. 4, pp. 303-318.

observation of cases after first diagnosis or knowledge of the disease. Each year of life of the tuberculosis case is considered as a unit and the life experience of each case is calculated from the date of diagnosis or from the date the case was first known to the County Department of Health to the end of the period of observation, namely, December, 1936.[6] The longest possible period of observation was thirteen years, and the shortest was from one to two years.

For the more precise study of mortality of tuberculous persons, it is necessary to classify them according to the stage of the disease when first diagnosed or reported. The data include 135 cases classed as minimal, 207 classed as moderately advanced, and 160 classed as far advanced.[7] Thirty-eight per cent of the 135 minimal cases had a period of sanatorium care (three months or longer); 43 per cent of the 207 moderately advanced cases had a period of sanatorium care (three months or longer); and 58 per cent of the 160 far advanced cases had some sanatorium or hospital care.

MORTALITY AND RATE OF CESSATION OF CLINICAL ACTIVITY (ARREST) OF TUBERCULOSIS CASES[8]

Mortality of Tuberculosis Cases. Table 1 shows the average an-

[6] This is essentially the life-table method used and described by the late Dr. W. H. Frost in a paper, "Risk of Persons in Familial Contact with Pulmonary Tuberculosis," which he presented, at the annual meeting of the American Public Health Association, in 1932. Dr. Frost at that time pointed out the value of the method and the fact that it had been applied very little to data readily available from the experience of public health organizations and clinics. At that time he urged that it be used more widely. *See* Frost, W. H.: Risk of Persons in Familial Contact with Pulmonary Tuberculosis. *The American Journal of Public Health*, May, 1933, xxiii, No. 5.

[7] From the group of minimal cases, one case was excluded because the case moved from the County shortly after diagnosis and could not be traced. This case was observed less than five months. From the group of moderately advanced cases, 4, or 1.8 per cent, were excluded because they were not known of until after death. Six cases, or 2.8 per cent, of the total 217 cases were excluded because they were observed less than five months. From the group of far advanced cases, 15, or 8.6 per cent, of the total 175 cases were excluded because they were not known of until after death. Also, only a few cases (9) of active adult pulmonary tuberculosis have been diagnosed or reported among children under 15 years of age in Cattaraugus County during the period 1923-1935; consequently, all cases under 15 years of age have been excluded. In all, 35 cases, or approximately 7 per cent of the total 537 cases, have been excluded for one or another of the above reasons.

[8] No important sex differences were noted in preliminary analyses of the data; consequently, all data are shown for both sexes combined.

Age Groups	Mortality per 100 Persons per Year			Number of Deaths			Population (Years of Observation)[2]		
	Minimal	Moderately Advanced	Far Advanced	Minimal	Moderately Advanced	Far Advanced	Minimal	Moderately Advanced	Far Advanced
15-69	4.1	9.2	46.8	28	85	130	676.0	924.0	278.0
Rates Adjusted for Age[1]	4.2	9.2	47.1						
15-24	3.1	10.9	56.2	4	22	36	127.5	202.5	64.0
25-34	4.1	9.3	28.9	9	25	25	219.5	270.0	86.5
35-44	4.0	7.9	58.4	7	14	26	174.5	178.0	44.5
45-69	5.2	8.8	51.8	8	24	43	154.5	273.5	83.0

[1] Rates adjusted to the age distribution of the combined years of life for all three types of cases (minimal, moderately advanced, and advanced).
[2] Based on total years that each case was observed, both during period of clinical activity of disease and after cessation of activity.

Table 1. Annual mortality from all causes among active cases of adult pulmonary tuberculosis classed as minimal, moderately advanced, or far advanced when first diagnosed or reported.

nual mortality from all causes for cases in each of the three groups: minimal, moderately advanced, and far advanced.[9] In this table the years of observation of the cases, that is, the population, are years of observation at specific ages. They include all of the years each case was observed, both those during the period of clinical activity and those after clinical activity had ceased. Cases diagnosed in the minimal stage suffered the lowest mortality with a rate of 4.1 per 100 persons per year. Moderately advanced cases had an average annual mortality slightly more than twice as high as for minimal cases, namely, 9.2 per 100 persons. Far advanced cases suffered a mortality far in excess of either moderately advanced or minimal cases. The average annual death rate, 46.8 per 100, was more than four times the rate noted for moderately advanced cases, and more than ten times the rate among minimal cases. The differences between the death rates noted for each of the three groups are statistically significant, that is, they are greater than would be expected

[9] The mortality data for all cases include all deaths, both those which occurred in Cattaraugus County and those which occurred outside the County.

to occur as chance variations.[10] It is thus apparent that the mortality increases as the anatomical extent of the tuberculous process, designated by stage, increases. This is entirely in accord with conclusions drawn from clinical observation.

The death rates at specific ages for each of the three groups, as shown in Table 1, are based upon such small numbers that it is unwise to attach significance to variations at different ages for any of the three classes of cases; nevertheless, it is of interest to note that there is some indication that aging as a factor in increasing the chances of mortality has a greater opportunity to operate among minimal cases than among moderately advanced or far advanced cases.

The force of mortality among each of the three classes of cases of active adult pulmonary tuberculosis can best be portrayed by contrasting the actual number of deaths in each class with the number of deaths which under normal conditions might be expected to occur within a group of the same size with such an age distribution.[11] Table 2 shows that among the individuals with minimal tuberculosis 5.3 deaths would be expected, whereas 28 deaths actually occurred, or slightly more than five times the expected number. Deaths occurred among persons with moderately advanced tuberculosis approximately ten times as frequently as would be expected

10

Average Annual Rate per 100		
Minimal	**Moderately Advanced**	**Differences**
4.1 ± 0.46	9.2 ± 0.67	5.1 ± 0.55
Moderately Advanced	**Far Advanced**	
9.2 ± 0.67	46.8 ± 1.15	37.6 ± 0.90

[11] This comparison can be made by applying the life table mortality for Cattaraugus County at specific ages to the population of each group of cases to ascertain the number of deaths which might be expected if the tuberculous individuals died at the rate prevailing in the County generally. The life table for Cattaraugus County for the period 1926-1928 was used.

Age Groups	Minimal		Moderately Advanced		Advanced		Cattaraugus County (1926-1928)[1] Rate per 1,000 Persons Per Year
	Observed Deaths	Expected Deaths	Observed Deaths	Expected Deaths	Observed Deaths	Expected Deaths	
15-69	28	5.3	85	8.6	130	2.7	
15-24	4	0.4	22	0.6	36	0.2	3.0
25-34	9	0.9	25	1.1	25	0.3	3.9
35-44	7	1.2	14	1.2	26	0.3	7.0
45-54	5	1.1	8	1.5	20	0.4	11.5
55-69	3	1.7	16	4.2	23	1.5	29.5

[1] Data from: Life Expectancy in Cattaraugus County. Milbank Memorial Fund *Quarterly Bulletin*, January, 1930, viii, No. 1, pp. 13–16.

Table 2. Observed number of deaths from all causes in each of three population groups composed of active cases of adult pulmonary tuberculosis contrasted with the expected number of deaths in the same populations if the community rate is applied to these populations.

under normal conditions; 85 deaths were observed in this group and the expected number was 8.6 deaths. The observed number of deaths, 130, among persons with far advanced tuberculosis was slightly more than fifty times the expected number of 2.7.

Though the data of this study are not strictly comparable with data of post-sanatorium patients, it is of interest that the mortality of these cases drawn from Cattaraugus County, representing an average experience, was similar to the results of studies of a more selected group (post-sanatorium patients), cited by Hilleboe.[4] For example, data drawn from the Midhurst Sanatorium and the Brompton Sanatorium in England, the Trudeau Sanatorium, and the Metropolitan Life Insurance Company's sanatorium in New York State indicated that in general a person with minimal tuberculosis has his risk of dying increased approximately four times; moderately advanced, sixteen times; and far advanced, forty times over that of persons in the general population.

Cessation of Clinical Activity or Arrest of Disease. In a study of the outcome of active cases of pulmonary tuberculosis, it seems suitable to show the average annual rate at which cases obtained a

Age Groups	Arrests per 100 Persons per Year		Number Becoming Arrested		Population (Years of Observation)[2]	
	Minimal	Moderately Advanced	Minimal	Moderately Advanced	Minimal	Moderately Advanced
15-69	27.1	15.8	94	98	346.5	622.0
Rates Adjusted for Age[1]	27.9	15.8				
15-24	25.4	15.6	23	25	90.5	160.0
25-34	26.9	13.8	33	26	122.5	188.5
35-44	23.9	20.0	19	20	79.5	100.0
45-69	35.2	15.6	19	27	54.0	173.5

[1] Rates adjusted to the age distribution of the combined population of the two groups (minimal and moderately advanced).
[2] Based only on years of observation during period of clinical activity.

Table 3. Annual rate of arrest of activity of disease among surviving individuals with adult pulmonary tuberculosis classified according to stage of disease when first reported or diagnosed.

cessation of clinical activity of disease.[12] Table 3 shows the rate at which clinical activity of disease ceased for minimal and moderately advanced cases. In Table 3 the population, or years of observation, for each case is limited to the total years when the disease was considered clinically active. Years of observation at specific ages are shown. The data in Table 3 indicate that improvement in the status of the disease is obtained with much greater frequency among individuals classed as minimal when first diagnosed than among those with moderately advanced disease. The average annual rate of cessation of clinical activity was 27.1 per 100 persons in the minimal group contrasted with 15.8 among cases classed as moderately advanced. Adjustment of these rates in order to take account of the influence of differences in the age distribution of the two groups affects them only slightly. Since the difference between the

[12] Cessation of clinical activity of disease (arrest) means complete cessation of a known previously active tuberculous process as nearly as can be determined by X-ray and clinical examination. All constitutional symptoms absent; sputum, if any, must be concentrated and found microscopically negative for tubercle bacilli; lesions stationary or retrogressive; no evidence of pulmonary activity. These conditions shall have existed for a period of six months, during the last two of which the patient has been taking one hour's walking exercise twice daily or its equivalent.

crude rates, 11.3 ± 1.24, is slightly more than nine times its probable error, it may be considered as significant and not due to chance variations. This experience among active cases in Cattaraugus County with respect to cessation of clinical activity of the disease is in agreement with the conclusion drawn from clinical observation that the mortality risk is much lower in cases which, when first diagnosed, show minimal lesions than in cases which show moderately advanced lesions; consequently, the chances of improvement are greater for the minimal cases.

Reactivation of Cases in Which Clinical Activity Has Ceased. A question which deserves consideration by those engaged in combating tuberculosis is what is the frequency of occurrence of reactivation or breakdown among cases in which clinical activity of the disease apparently has ceased. The data of cases drawn from Cattaraugus, even though small in number, offer some interesting indications concerning this question. Table 4 shows the reactivation rate among improved cases in the minimal and in the moderately advanced classes. The population in Table 4 (years of observation) is restricted to the total years observed for each case after clinical activity of the disease had ceased and the case had been classed as arrested. Also, years of observation at specific ages are shown. The

Table 4. Annual rate at which surviving cases classed as arrested (clinical activity having ceased) again became active.

Age Groups	Rate per 100 Persons per Year		Number Becoming Active Again		Population (Years of Observation)[1]	
	Minimal	Moderately Advanced	Minimal	Moderately Advanced	Minimal	Moderately Advanced
15-69	4.9	5.9	16	18	327.5	303.0
15-29	8.4	9.7	7	8	83.5	82.5
30-49	4.1	4.3	7	6	170.5	140.5
50-69	2.7	5.0	2	4	73.5	80.0

[1] Based only on years of observation during period of arrest of disease. Includes only cases known and observed to have had active clinical tuberculosis before arrest or cessation of activity.

reactivation rates, 4.9 and 5.9 per 100 persons per year, for minimal and moderately advanced, respectively, are strikingly similar. It is also interesting to note that the rates at specific ages are generally similar. Furthermore, among both minimal and moderately advanced cases, the reactivation rate at ages 15-29 is twice as high as that for any of the other age groups. These data are based upon such a small sample of cases that it is unwise to go far in the interpretation of their meaning; however, they suggest that the anatomical extent of the tuberculous process is not necessarily the dominant factor in producing reactivation or a second breakdown from the disease. Rather, the inference may be drawn that physiological factors, as well as social and economic factors, play important roles.

MORTALITY AND CESSATION OF CLINICAL ACTIVITY OR ARREST OF DISEASE WITHIN SPECIFIED INTERVALS AFTER DIAGNOSIS

The period of time within which the risk of mortality among active cases of tuberculosis is concentrated is of considerable interest to those engaged in tuberculosis work. Conversely, the period of time within which the frequency of cessation of activity of disease among cases is greatest is also of importance. The data of this study can be used to show for a five-year period the experience of minimal and moderately advanced cases with respect to the two factors, mortality and arrest of disease.

The data presented in the first part of this study are in life-table terminology and have shown the average experience of tuberculous individuals with clinically active disease with respect to mortality and arrest of disease. To indicate the relation between time and the operation of the factors, mortality and cessation of clinical activity of disease, a special calculation has been made which shows the mortality and rate of arrest for successive annual periods of observation following the diagnosis. These rates are shown for minimal and moderately advanced cases in Tables 5 and 6. In obtaining these rates, all cases observed during one complete year

Years After Diagnosis	Minimal			Moderately Advanced		
	Observed Population (Active and Arrested Cases)	Number of Deaths in Each Year	Rate per 100	Observed Population (Active and Arrested Cases)	Number of Deaths in Each Year	Rate per 100
1st	135	5	3.7	207	21	10.1
2nd	115	5	4.3	170	15	8.8
3rd	91	4	4.4	138	17	12.3
4th	77	4	5.2	103	10	9.7
5th	50	3	6.0	83	10	12.0

Table 5. Observed rate of mortality among active minimal and moderately advanced cases of adult pulmonary tuberculosis in successive years after diagnosis.

are used to determine the outcome of the cases within twelve months of diagnosis. Similarly, in determining the chances of an active case becoming arrested in the second year following diagnosis, all cases active at the end of one year and observed for another twelve-month period are included. In the same manner, mortality in the first year is shown for all cases observed during that year and in the second year for all cases alive at the end of the first year. The outcome in successive years up to five years is obtained by this method for all cases observed for each specified annual period.

The values or rates shown in Tables 5 and 6, which represent the

Table 6. Observed rate of arrest (cessation of clinical activity) among active minimal and moderately advanced cases of adult pulmonary tuberculosis in successive years after diagnosis.

Years after Diagnosis	Minimal			Moderately Advanced		
	Observed Population (Active Cases)	Number of Arrests of Clinical Activity in Each Year	Rate per 100	Observed Population (Active Cases)	Number of Arrests of Clinical Activity in Each Year	Rate per 100
1st	135	21	15.6	207	6	2.9
2nd	98	37	37.8	165	40	24.2
3rd	46	16	34.8	100	20	20.0
4th	30	5	16.7	61	13	21.3
5th	26	6	23.1	36	7	19.4

observed experience in a changing population, may be utilized to calculate the probabilities of mortality or arrest among a group of cases followed continuously for a five-year period. Such a calculation is presented in Table 7 for a theoretical series of 100 minimal cases and 100 moderately advanced cases. The method may be explained by briefly stating the steps followed for determining the rate of arrest and mortality for the first two years. As shown in Table 5, the observed mortality within the first year after diagnosis was 3.7 per cent for minimal cases, and, therefore, in the theoretical group of 100 cases, 3.7 cases would die in the first year. Among the surviving cases, 96.3, the mortality would be 4.3 per cent in the second year and 4.3 per cent of 96.3 is 4.1, or the number of cases that die in the second year. Cumulating the deaths in the first year

Table 7. Calculated cumulative mortality and rate of arrest among active minimal and moderately advanced cases of adult pulmonary tuberculosis.

Years After Diagnosis	Number Alive (Active or Arrested)	Observed Per Cent Died[1]	Number Died	Cumulated Mortality Out of 100 Cases	Number of Active Cases[3]	Observed Per Cent Arrested[2]	Number Arrested	Cumulated Number of Arrests Out of 100 Cases
	MINIMAL CASES							
	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8
1st	100.0	3.7	3.7	3.7	100.0	15.6	15.6	15.6
2nd	96.3	4.3	4.1	7.8	80.7	37.8	30.5	46.1
3rd	92.2	4.4	4.1	11.9	46.1	34.8	16.0	62.1
4th	88.1	5.2	4.6	16.5	26.0	16.7	4.3	66.4
5th	83.5	6.0	5.0	21.5	17.1	23.1	4.0	70.4
	MODERATELY ADVANCED CASES							
1st	100.0	10.1	10.1	10.1	100.0	2.9	2.9	2.9
2nd	89.9	8.8	7.9	18.0	87.0	24.2	21.1	24.0
3rd	82.0	12.3	10.1	28.1	58.0	20.0	11.6	35.6
4th	71.9	9.7	7.0	35.1	36.3	21.3	7.7	43.3
5th	64.9	12.0	7.8	42.9	21.6	19.4	4.2	47.5

[1] Values taken from Table 5.
[2] Values taken from Table 6.
[3] The number of active cases in each year is 100 less the cumulated number of arrested and dead in the preceding years.

and the second year (Col. 4, Table 7), the deaths within a two-year period equal 7.8 and the mortality rate is 7.8 per cent since the number of cases is 100. This same procedure is carried out for each specific year for both minimal and moderately advanced cases, and a comparable procedure is followed in determining the number of arrests of clinical activity in the original groups of 100 active minimal and moderately advanced cases.

The cumulated per cents of cases dying, found in Col. 4 (Table 7), indicate that 22 per cent of the active cases diagnosed as minimal was dead at the end of five years, and 43 per cent of the cases diagnosed as moderately advanced. The cumulated number of arrests at each time interval, shown in Col. 8 (Table 7), indicates that for active cases of adult pulmonary tuberculosis diagnosed in the minimal stage, it is reasonable to expect that at the end of five years 70 per cent will probably be classed as nonactive; for those diagnosed as moderately advanced, 48 per cent will have shown a cessation of clinical activity of disease.

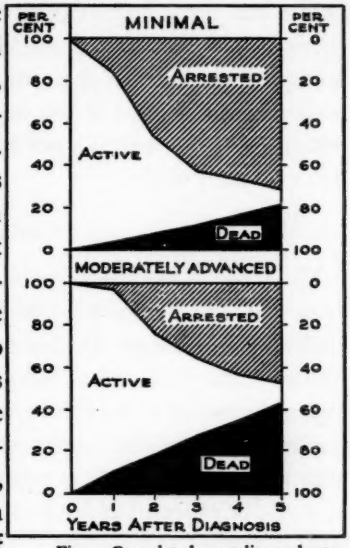


Fig. 1. Cumulated mortality and rate of arrest among active minimal and moderately advanced cases of adult pulmonary tuberculosis in successive years after diagnosis. (Rates of mortality are plotted according to the scale on the left-hand side of the chart; rates of arrest are plotted according to the scale on the right-hand side of the chart.)

The cumulated mortality and the cumulated rate of cessation of clinical activity for each of the five years after diagnosis are shown in Figure 1 for minimal and moderately advanced cases, respectively. The figure illustrates strikingly the similarities and differences between minimal and moderately advanced cases in respect

to the proportion dying or becoming arrested within the five-year period. For example, both for minimal and moderately advanced cases the proportion becoming arrested is greatest within the first three years after diagnosis; in the following two years the proportion increases more slowly for both groups of cases.

Mortality exerted its greatest force among moderately advanced cases during the first three years after diagnosis; 28 per cent died during that interval, and within the next two years an additional 15 per cent died. There is very little tendency for the cumulative curve of mortality among moderately advanced cases to reach an asymptote within the five-year period. The curve of mortality among minimal cases shows no diminution. The total mortality within five years was 21.5 per cent, and the year-to-year variation was extremely slight.

CONCLUSION

This study of mortality among cases in Cattaraugus County indicates that active pulmonary tuberculosis has an exceedingly high fatality. Even though diagnosed in the minimal stage, the disease offers a distinct hazard to life. Slightly more than five times the expected number of deaths occurred among individuals with active minimal tuberculosis; deaths occurred among those with moderately advanced tuberculosis approximately ten times as frequently as would be expected under normal conditions; and among persons with advanced tuberculosis the observed number of deaths was fifty times the expected number.

In view of the fact that from 4 to 5 per 100 cases per year suffer a breakdown after a reasonably satisfactory arrest of the disease has been obtained, it seems suitable to call attention to the need for study of causes of breakdown. Undoubtedly reactivation of disease contributes to the after-mortality of cases.

The observed experience of active cases of adult pulmonary tuberculosis in Cattaraugus, when utilized to calculate the probabilities

of mortality or arrest of clinical activity, indicated that after a period of five years 22 per cent of the active cases diagnosed in the minimal stage was dead and 70 per cent was classed as nonactive. Among moderately advanced cases 43 per cent had died and 48 per cent had shown a cessation of clinical activity of disease.

In conclusion it is pertinent to point out that these data show clearly the seriousness of the adult pulmonary form of tuberculosis. Furthermore, the findings of this study may serve to emphasize anew that it is important that the program of control be directed toward prevention of the spread of infection so that active cases of the disease will develop much less frequently.

ANNOTATIONS

TUBERCULOSIS AMONG CHILDREN AND YOUNG ADULTS[1]

THE volume is a revised edition of TUBERCULOSIS AMONG CHILDREN published in 1930. The original text has been rewritten in several particulars and an entirely new section presented on the general subject of tuberculosis in young adults. The book is divided into three parts: Tuberculosis in Infancy; Tuberculosis in Childhood; and Tuberculosis Among Young Adults. In each section the author presents the practical working concepts of our present knowledge.

While he mentions tuberculosis in adults at various points the general impression remains that the ultimate control of the disease in his mind is a problem among the age groups through young adult life. Also, the text naturally reflects the experience of the author in the Middle West where the death rates from tuberculosis are much lower than in many other places, particularly the Atlantic Seaboard. As important as these groups may be, they, after all, should be considered in the light of their relative importance with the adult group.

If as he states under dangers of infection—"The only rational attitude is to protect all human beings, of whatever age, against exposure"—then it must follow that our first concern is to control open foci of infection, which are far more numerous in the adult population.

The author has done an admirable piece of work in his extensive reviews of the vast literature on this subject, which is indicated in the complete bibliography following each chapter. He has in his own inimitable style shorn the welter of scientific findings, both pro and con on a given subject, of their apparent meaningless phrases and put them into succinct statements of practical import. Thus this volume is a distinct

[1] Myers, J. Arthur: TUBERCULOSIS AMONG CHILDREN AND YOUNG ADULTS. Illinois, Springfield, Charles C. Thomas. 1938.

contribution to the present day knowledge of tuberculosis, and should appeal to the general practitioner, the medical student, the nurse, the social worker, and the nonprofessional group interested in tuberculosis work. He points out that from an experience of over 15 years that the child who reacts positively to the tuberculin test is five times more likely to develop clinical tuberculosis during the teen age period than the child who reacts negatively. Thus he states: "However, to continue to make periodically large numbers of x-ray films of the chests of *young* children, even those reacting positively to the tuberculin test, would be wasteful as far as tuberculosis is concerned."

The chapter on sensitivity and immunity to tuberculosis is worthy of reading by all interested in this field, and it is around this thesis that the book has been written. The author admits sensitization of the tissues that may wax or wane with altered conditions, and from this very fact the question arises as to the relationship of sensitization to immunity—if it exists. He concludes wisely that from existing evidence it is unsafe to draw conclusions from the results obtained in any one animal species. Also that the incidence of disease in the various races is not an index to immunity. This is a newer concept than usually expressed on this phase of the subject. In a single sentence he expresses what is perhaps the most practical interpretation of immunity—"Perhaps there is no physician in the country who has enough confidence in the immunity established by the first infection type of tuberculosis to expose his own infant to tuberculous patients, in order to develop a so-called protective infection."

In discussing the preventive aspects of tuberculosis in either of the three age groups presented, the point is made that a single survey is of limited value as it indicates a condition existing only at that time. The complete program must involve a retesting to detect as near as possible the time of infection, and a subsequent follow-up based on the problem presented and not a matter of mechanical routine. This is an ideal program that can rarely be followed, particularly in those areas with a high death rate. Here again each community must allocate its efforts in a relative proportion to the presenting problem, and usually it will be found that a major portion of the emphasis should be directed toward the adult group.

In the section dealing with young adults the author discusses primarily high school and college pupils, and medical and nursing students. Much space is given to the reinfection types seen so frequently and particularly the treatment required. Here the author emphasizes the use of artificial

pneumothorax in minimal lesions limited to one lung and proved to be progressive. The indications for such care are explicit and it is to be hoped that those who are more enthusiastic about pneumothorax will not interpret it to mean wholesale collapse therapy for all early cases. The development of mass survey programs today are revealing hundreds of early infiltrates many of which will resolve satisfactorily with bed rest, but in the name of the public health there is a growing sentiment from some quarters that pneumothorax be employed more promptly in all early cases.

The author has very greatly emphasized the importance of the private practitioner's place in the general control program. He also raises the point of certification of nurses, teachers, as well as households with regard to tuberculosis. Such a plan is not as difficult as may be expected and can be accomplished by the practitioner in his office in a great many instances.

This volume is a lucid presentation of practical working facts on the present day concepts of a subject that continues to be a major problem of the public health.

H. R. EDWARDS, M.D.

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SYPHILIS, GONORRHEA AND THE PUBLIC HEALTH[1]

THE authors of this book are to be congratulated upon the success with which they have solved the many problems which must have arisen in presenting the salient facts about the natural history and control of these two diseases to the diverse groups which are, or should be, interested. The book is written for "health officers, physicians, nurses, social workers and public health workers in general, as well as that part of the general public which is interested in the control program."

The three main divisions of the work will appeal to different groups of readers, but each is comprehensive and authoritative enough to justify getting the book for its sake alone. The first main division (Part II) outlines for syphilis and gonorrhea separately the basic facts about the causative agent, course of infection, diagnosis, treatment—including unfavorable reactions to treatment—and modes of infection. It is unfortunate that a more definite position could not have been taken on the treatment

[1] Nelson, Nels A. and Crain, Gladys L.: SYPHILIS, GONORRHEA AND THE PUBLIC HEALTH. New York, The Macmillan Company, 1938. 360 pages.

of gonococcal infections with sulfanilamide at the time this section was written, but the authors have at least taken a conservative stand in awaiting the verdict of more extensive trial. The discussion of the clinical aspects of these infections uses technical terms, but these are explained in sufficient detail so that laymen should have little difficulty. Medical readers will find these chapters highly informative.

The second main division (Part III) consists of a review of the somewhat fragmentary knowledge of the general epidemiology of gonorrhea and syphilis, each item being presented with due regard for its limitations.

The third main division (Parts IV and V) is the most significant for the public health worker, for it discusses control programs and the problems encountered in their formulation and application. Few Gordian knots are cut but the authors offer practical approaches to the solution of questions confronting both state and local health workers, including methods of reporting, case-finding and case control, the provision of laboratory, therapeutic and consultation services, education of the various groups chiefly concerned, the relative duties of nurses and of social workers, financing, and the relationship of social hygiene to the control program.

It does not detract from the value of the book to say that the discussion is largely from the point of view of the control program as developed by the Massachusetts Department of Public Health, for that State has an advanced program—thanks in no small degree to the senior author. In its broad outlines the Massachusetts program accepts the measures recommended by the Public Health Service for state and local health departments in January, 1936.[2] However, there are a number of respects in which it is definitely at variance with current practice elsewhere and with the recommendations, expressed or implied. Among these are the inclusion of gonorrhea with syphilis on an active basis in the control program, and the fact that legislation "against" the disease is kept at a minimum. The authors cite conflicting viewpoints and give their opinions. No one who reads the book will doubt that the opinions are cogently expressed.

The last division of the book is more than a statement of a program; it is a record of quite intensive experience and thought, for it was hardly a decade ago that the senior author completed his qualification for appointment by admitting that he knew very little about these two diseases.

RALPH E. WHEELER, M.D.

[2] Vonderlehr, R.A. *et al:* Recommendations for a Venereal Disease Control Program in State and Local Health Departments. *Venereal Disease Information,* January, 1936, xvii, No. 1, pp. 1-16.